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Minister for Agriculture.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XII. Part 1. 10th January, 1914.

BEE-KEEPING IN VICTORIA.

(*Continued from page 724, Vol. XI.*)

By F. R. Beuhne, Bee-Expert.

XX.—TREATMENT OF HONEY AFTER EXTRACTING.

Clear honey realizes a better price than cloudy or congealed samples; the latter is the trade term applied to candied honey. Producers should, therefore, aim at having their honey remain clear and liquid for as long a time as possible. This can be accomplished by the removal of the factors which hasten granulation, namely, excess of moisture, pollen grains and air bubbles.

The percentage of water in honey depends upon the degree of humidity of the atmosphere at the time the nectar is gathered and converted into honey by the bees, and, to a lesser degree, the flora from which the nectar was obtained. Honey the produce of ground flora such as clovers, dandelion, cape weed, &c., is generally not so dense as honey from eucalypts, and as a rule candies quickly.

When granulation takes place, the crystallizing sugar will sometimes settle to the bottom of the vessel, while the non-crystallizing portion remains on top. This peculiarity of some honeys is often noticed when it is put up in glassware, and has given rise to the erroneous idea that sugar has been added.

In a moist district, or in any locality late in the season, honey should not be extracted until the combs are well sealed over by the bees. Not only does the percentage of water in honey stand in a certain ratio to the humidity of the atmosphere at the time of gathering, but even after being extracted it will give off or absorb water from the atmosphere, acting in this respect much in the same way as salt.

In the combs of the bee-hive, honey is to a large extent protected against the varying influence of atmospheric moisture by the wax cap with which each cell is closed by the bees, when the honey has reached a certain degree of density. The honey producer should adopt the same means of excluding moisture by hermetically closing the vessels containing honey. Further, it should be noted in connexion with the wintering of bees, that the winter stores should consist of sealed honey. Honey gathered late in the season, stored into combs previously extracted, cannot be properly ripened and sealed over by the bees owing to the low temperature and high humidity of the atmosphere, and when consumed by the bees will react detrimentally on their health and vitality. When bees are in a state of nature, little or no honey will be stored so late in the season, all available comb having been filled earlier. The building of new comb is possible only at a comparatively high temperature.

HEATING HONEY TO PREVENT GRANULATION.

During or after extracting all honey should be heated to 160 degrees (Fahr.). At this temperature, honey is as thin as water, readily clears itself of air bubbles, pollen grains, and particles of wax, all of which rise to the surface, while at the same time a certain percentage of water evaporates and some of the crystallizing sugar is inverted, or changed into a non-crystallizing kind.

At ordinary temperature honey is an exceedingly sluggish liquid, and it is impossible to strain it through anything fine enough to reremove impurities. With the application of heat, the necessity for straining disappears, all impurities rising to the surface, where they can be skimmed off when the honey is cooled down again. As stated, honey is a sluggish liquid, but it is also a poor conductor of heat: it is very important not to lose sight of these two factors when heating honey, otherwise it may be badly injured in colour and flavour.

When heat is applied to a vessel containing water, circulation at once commences, and the temperature of the whole body rises simultaneously; not so with honey; it is quite possible to burn portion of a tin of honey while the remainder is still quite cold, or in a candied state. Thus, it will be seen that the methods employed in heating other liquids cannot be used for honey. Heat should never be applied direct. Vessels containing the honey to be heated should be put into another vessel containing water. The heat is applied to the outer vessel either direct, by means of hot water circulation or by steam conducted into the water. The temperature of the water surrounding the tins should never exceed 170 degrees Fahr., unless the honey is kept in motion by continuous stirring.

If honey is heated at time of extracting it will not only be much clearer and brighter, but the candying will be, to a great extent, prevented, or considerably delayed. Moreover, honey so heated, if eventually it does candy, while still in the hands of the producer, will not throw up a layer of scum when being reliquified, as is the case with honey not previously heated.

It is, therefore, desirable that all honey should be heated before being packed for market; but as at extracting no time is available to

heat honey in the laborious way of immersing tins in hot water before emptying them into the settling tank, an apparatus which will automatically heat the honey on its way from the extractor to the honey tank, is a great labour-saving device in the production of honey on a large scale. This apparatus, known as the honey-heater, consists of an inclined plane, divided off into a number of narrow races, down which the honey from the gate of the extractor passes in a thin stream over a hot metal surface. Quick heating to the required temperature is obtained by the spreading out of the stream of honey over a comparatively large surface. The apparatus is constructed of tinned copper and filled with water, which is heated by means of a blue flame stove placed underneath. The correct temperature of the heated honey is ascertained by means of a thermometer, over the bulb of which the honey runs before entering the tank, and regulated by the raising or lowering of the flame of the stove.

Liquifying Candied Honey.

When honey has candied solidly, it cannot be liquified hurriedly; from eight to ten hours will be required at a temperature of 165 degrees in a hot water bath for honey set hard in 60-lb. tins.

To compensate for the slowness of this process, the heating of the water bath should be so arranged that the correct temperature is maintained automatically. This is best accomplished by using the blue flame stove illustrated in the previous chapter. When large quantities of candied honey have to be liquified, provision should be made for heating a number of tins simultaneously in a bath holding from twelve to sixteen 60-lb. tins. If such a bath is constructed specially for the purpose, the dimensions should be such that there is a space of ½ to 1 inch between the tins. These should rest on strips of wood at least ½ inch thick, so as to prevent contact between the bottom of the tins and the bottom of the bath, and to allow the water to circulate all round the tins. The bottom half of a square 400-gallon water tank which has been cut in two horizontally is used by some bee-keepers for heating honey. Battens are laid across the bottom for the honey tins to rest upon. The tank is placed over a small excavation, or on a few bricks, so that a small fire can be lighted under it. It is filled with water to near the top of the honey tins, of which it holds sixteen.

When a specially made bath is used, it is best to use hot water circulation instead of a fire underneath. The bath may consist of a stout wooden case of the desired dimensions, lined with galvanized iron and connected by means of two pipes with a boiler made of an oil drum or a copper closed with a dome. The boiler or copper is set in the fireplace, while the bath may be some little distance away on the floor of the honey room, and thus the heating of the honey may be done indoors at any time, and with a minimum of shifting about of the heavy honey tins.

In liquifying candied honey, it should be remembered that every particle must be dissolved, otherwise granulation will soon recommence, the remaining undissolved crystals, however small, acting as nuclei for fresh crystallization.

(To be continued.)

RUTHERGLEN EXPERIMENT FARM.

SECOND ANNUAL FARMERS' FIELD DAY.

(Report abridged from the "Rutherglen Sun," 18th November, 1913.)

The idea of the Hon. the Minister for Agriculture (Hon. G. Graham) and the officers of the Agricultural Department in arranging a field day at the Rutherglen Experimental Farm (Viticultural College) was an exceptionally happy one. It gave the farmers of the district an opportunity of viewing the results of the practical work that the Agricultural Department is carrying out at this experimental farm in the interests of the farmers throughout the State; in fact, it may be said Australia, for the information gained by the researches is published for the benefit of farmers generally.

The publication of articles on the growing of cereals, and the results of the researches carried out, give farmers theoretical knowledge of their industry. On the other hand, the bringing of three or four hundred

The Minister of Agriculture (Hon. Geo. Graham, M.L.A.), welcoming visitors to the Rutherglen Experiment Farm on Farmers' Field Day.

tillers of the soil together, men who have had practical knowledge of farming on the old system—what father did is the right thing for me to do—and showing them the great advantages that are to be gained by bringing scientific knowledge to work side by side with practical knowledge, is doing something that will in the near future have beneficial results.

Friday's gathering at the Experimental Farm was a fine one; it was a representative gathering of farmers of the big district that lies west of the North-Eastern railway line and between the Oveus and Murray Rivers. Barnawartha, Gooramadda, Chiltern, Brown's Plains, Rutherglen, Wahgunyah, Norong, Boorhaman, Bontherambo, Springhurst and Wangaratta were represented. Besides the district farmers there were also visitors from other parts of the State.

The Department, through Dr. Cameron, Director for Agriculture invited farmers from all parts of the State to be present, and invitation were sent to the Agricultural Societies of the North-Eastern an

Riverina Districts, inviting their members to visit Rutherglen on the field day—14th November—at the Experiment Farm, Rutherglen.

Those who accepted the invitation will remember their visit as a red letter day, as what they saw, and the information that was given them by Mr. Richardson, M.A., B.Sc., agricultural superintendent, will long be remembered, and in many cases have beneficial results when harvest preparations are being made next year. One gentleman remarked that he had no idea that the Government of the day was carrying out such fine work in the general interests of the rural industries of the State.

The time chosen for the visit was very appropriate, as the whole of the crops were looking exceptionally fine, in full ear, and at a stage when their approximate yields could be judged.

People may ask, what was there to be shown to visitors beyond the growing of a few acres of crop? This may be so from a pessimist's point of view. Mr. Richardson, M.A., B.Sc., and his two assistants, Messrs. Whelan (wheat expert), and Harmer (farm manager), and the principal of the college, Mr. G. H. Adcock, F.L.S., had something more interesting to show and tell. The big wheat crop—142 acres—alone was worth travelling miles to view. What the experts had to show and tell the farmer was the growth of different varieties of seed treated with different varieties and quantities of manure. It was an object lesson in a practical form, for at the head of each plot of growing wheat was a record board, giving variety of wheat, depth of ploughing, fallowed or not, the class and quantity of manure used, also the quantity of seed used. Everything is so well laid out that if a farmer required to see the result of a certain variety of wheat, be had only to look up his guide book, which was distributed by the officers, find out the number of section and plot in which it was growing, and he could without the assistance of the expert ascertain for himself the treatment the land of the particular block he was interested in had received, the quantity and class of manure used, the quantity of seed used per acre; and the only thing left to his own mind to work out was if the wheat grown on that particular plot was likely to yield better than wheat grown under the old system would. The best comparison of wheat growing under experimental conditions and ordinary conditions was the comparison of the college crops with one growing on an adjoining farm just across the road. The difference was very marked.

The Hon. the Minister of Agriculture (Mr. G. Graham) was accompanied by the Hon. J. Bowser (member for the district), Hon. R. B. Rees (North-Western Province), Mr. J. Livingston, M.L.A. (member for South Gippsland), Dr. Cameron (Director of Agriculture), Mr. Wilson (Werribee Central Research Farm), Dr. Green (lecturer on Chemistry at the University), Mr. Payne (Royal Agricultural Society), Mr. Sinclair, representative of the *Australasian,* and Mr. Pascoe, representative of the *Weekly Times.* Among those assembled were also Messrs. A. Clements (president, Ovens and Murray Agricultural Society), H. Halligan, secretary to that society); H. J. Oke, J. Dunne (Wangaratta High School), M. T. Graham (president, Rutherglen Shire Council), H. W. Allen (mayor, Borough of Rutherglen), H. O'Brien (secretary, Rutherglen Agricultural Society), Crs. Prentice, Smith, McLaurin, Doolan, Meehan, Gullifer, Hiskins, Morris, Macknight, of the Rutherglen Shire, and Crs. Gollings, Huhs, Bush, and Ready (Rutherglen Borough).

In a conversation Mr. Payne, who is interested in agriculture, and just returned from a trip to Europe, remarked:—"The Government of Victoria is doing more for the settlers and farmers than any other country in the world. In Europe or America work like this would have to be carried out by societies or councils. The whole of to-day's inspection is highly educational, and the experiments so far have been a success. The crops are tip-top and splendid. It is surprising to see them. The soil, from appearance, is not what would be called rich or good wheat land."

The Hon. the Minister for Agriculture stated that he wished to extend a hearty welcome to all present. He was pleased to see such a large and representative gathering of district residents. Many present were aware that about 25 years ago the land was reserved for a Viticultural College, and later became identified as a home for industrial school boys. There were about 900 acres, and with the exception of the 60 or 70 acres used for viticultural purposes, it was lying idle, used for the grazing of a few cows and sheep. On Mr. Richardson being appointed he took the matter in hand, and decided to establish a research farm. When the idea was suggested all sorts of failures were predicted, but he would leave it to those present to say, after their inspection, if the work of the past two years was a success or otherwise. Many were present last year at the first field day, when the crops were grown under adverse circumstances, and those who were so well pleased on that occasion would be able to make comparisons to-day. (Applause). He also wished to state that the Government of the day were establishing three of these research farms, with a central station at Werribee. Rutherglen had a year's start of Werribee, and it looked as if it was going to keep ahead of it. (Applause.)

The inspection commenced at the bulk wheats for seed distribution to farmers (see section 10 in Guide to Experiments below). A drive of about half-a-mile brought the visitors to the gates of the paddock, and a surprise was in store. Roads had been cut between the whole of the plots, which gave the critical visitor an opportunity of seeing the wheat to advantage. Mr. C. Kierath, one of our pioneer settlers, and who has grown many good crops, remarked as he was driving along the headlands, "My word, this is a fine crop; it stands well, it has stooled well, and the ears are well filled." The visitors were taken along the headlands, and it was no trouble to distinguish the different varieties, but they were surprised at the general evenness of the crop throughout. They drove through the crop with plots of Genoa and Federation on each side, and then along the bottom of the crop, and no difference was noticeable. The turn home was between plots No. 1 and 2, Huguenot and Zealand Blue. Coming up between these two plots a big surprise was received, as the Huguenot variety stood from 6 to 7 feet high, and samples of it were secured by those most interested. Throughout the rest of the inspection Mr. Richardson gathered the visitors together at frequent intervals, and explained the nature and objective of the work being carried out as set out in the Guide to Experiments following.

Special mention however should be made of the comparison between crops grown in rotation in plots and treated by fallow, manures, &c., and a plot grown in the centre of one of the sections on the continuous

cropping system without manures, &c. This latter plot showed a marked difference, and had more of the appearance of a crop of wild oats than one of wheat. Thus the old and new system of wheat growing was illustrated, and the advantages of the new system were a hundred-fold over the old.

After the inspection was completed, Dr. Cameron invited the guests to the marquee to partake of afternoon tea, and stated that an opportunity would be given the visitors and local residents to express an opinion on the work being carried out, and if it was worth being continued.

Mr. Bowser, M.L.A., proposed a vote of thanks to the Minister of Agriculture and his officers for the opportunity given to district residents to inspect the fields under the guidance of Mr. Richardson. To young farmers especially the growing wheats and the information given were valuable object-lessons, which he hoped to see repeated in future

Inspecting the Bulk Wheat Fields (Section 10).

years. Discoveries of great worth to the farmer and the State were possible from these uninterrupted tests of seed, manures, rotations of crops, seed selection, and other experiments. He welcomed the visitors from a distance.

Mr. M. T. Graham, in seconding the vote of thanks, stated that he was pleased to welcome the Minister to the district. He was pleased that Rutherglen had been selected one of the experimental stations. They should all be pleased at having a gentleman of Mr. Richardson's ability to carry out the experiments, which, he felt sure, would be of great benefit to the State.

The Hon. the Minister (Mr. G. Graham), who was received with applause, stated that he was grateful for the kind reception that had been tendered to him. He had pleasant recollections of Rutherglen thirty years ago, when he was a green politician, and the kind reception he then received. As it was his intention to retire from politics at the

expiration of the present Parliament, he was pleased at being able to be present to-day. The work carried out under Mr. Richardson's direction was a credit to the State. He had never before seen in Australia, during his fifty-six years' residence, the like of the 142-acre plot. It, and also the other plots, did credit to Mr. Richardson and his officers, Messrs. Whelan and Harmer. Some may say, in reference to experimental plots, can it be done on a large scale? The answer, "Yes," was given in Rutherglen by that fine plot of 142 acres. He was pleased that his colleagues, Mr. Livingston and Mr. Bowser, also the Hon. Mr. Rees, were present to see what was being done, and regretted the Premier had been unable to attend. He trusted that the work, the foundation of which was only being laid would be continued. (Applause.)

Mr. A. Prentice, J.P., proposed "The Visitors," coupled with the names of Mr. Livingston, M.L.A., and Hon. Mr. Rees, M.L.C., and extended a welcome to those gentlemen. He was pleased that they were present, as they would be able to go back and tell their colleagues of the work that was being done. He believed in giving the Government credit for what it was doing. It was said that the work would benefit the young people, but he thought the old people would also appreciate the work being carried out so ably by Mr. Richardson. They recognised that in Dr. Cameron, the Director, and Mr. Richardson, the Department had two excellent men, and trusted that they would continue with the Government to carry out this excellent work.

Mr. D. Smith, in seconding the motion, stated that the work being carried out was appreciated, but he trusted that it would not overshadow the development of the viticultural industry.

Hon. R. B. Rees, M.L.C., was received with applause. He said that he appreciated the splendid reception extended to him. He was pleased at having accepted the invitation to be present, as what he had seen was quite an eye-opener. Being a Wimmera "cockey," it was interesting to him. He had heard a good deal of Rutherglen, and read press criticisms, but there must have been great changes wrought. The work that Mr. Richardson was doing would not only be educational, but as a seed proposition would return fifty-fold, for if they continued to use the same seed for the next twenty years it would get stale, and production would fall away. In the Mallee they were gradually doing better, through manuring and the Federation wheat. The success of future cultivation would greatly depend on getting good seed, as seed would degenerate and go back, therefore the work being carried out at this and similar stations was going to be of great importance to the State. He had recently visited the Argentine, which was a great wheat country, but their methods and yields were not up to ours, but there was a greater total acreage. He would like to see the experiments carried out on commercial lines—that a plot of 320 acres be cultivated and the wheat harvested and marketed as commercial wheat, to get at the true results. (Applause.)

Mr. T. Livingston, M.L.A., stated that he had travelled with the Minister from Traralgon to see these plots. He thought that he was coming to see the usual pocket-handkerchief plots, and was surprised when he saw the magnificent field of wheat. He would like the De-

prove the natural grasses there. These experiments would do a great deal of good. This visit to Rutherglen had been quite a revelation, and it was his intention to come back again. He had seen all the experimental stations, and Rutherglen was the most practical. (Applause.)

Mr. J. D. Read (Springhurst) moved a vote of thanks to the officers who had supervised the plots, viz., Mr. Richardson, M.A., B.Sc., Mr. Adcock, F.L.S., Principal of the College, Mr. Whelan, and Mr. Harmer. What they had seen that day had been a great surprise to many visitors. It showed what the land was capable of producing when properly treated. The establishing of the research station should prove beneficial to district residents, and would be appreciated.

Cr. A. McLaurin stated that it was a pleasure to second the motion, as the carrying out of the whole of the work they had seen was due to the officers.

Mr. Richardson, in reply, stated that he appreciated the kind references that had been made. He was pleased that the work carried out was appreciated. A lot was due to Messrs. Adcock, Harmer, and Whelan for the manner in which they had carried out their work.

Mr. Adcock stated that his reply would be brief. He was glad to see so many present, and hoped that they would come again. He was always pleased to welcome visitors and give them information.

Messrs. Harmer and Whelan also replied.

Mr. A. Prentice proposed the health of Dr. Cameron, Director of Agriculture, who, in reply, stated that he was pleased to know that the efforts of the Department were appreciated. He felt sure that the money that had been provided for research work was being spent to the best advantage. He wished to thank all present for their attendance, which the officers appreciated.

GUIDE TO EXPERIMENTS, 1913.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Introduction.

The Rutherglen Viticultural College Reserve comprises 980 acres of land, of which some 60 acres have been planted with phylloxera resistant mother stocks, and 20 acres (at Wahgunyah) have been devoted to nursery work for the propagation of phylloxera-resistant rootlings. Of the remainder, approximately 750 acres are available for general farming.

The Rutherglen Viticultural Station has been of great assistance to the Viticultural Industry of the State by distributing each year large numbers of grafted vines for the reconstitution of phylloxera infested vineyards.

In 1912 it was decided to still further increase the usefulness of the institution by utilizing the farm area as an Experiment Farm for the prosecution of systematic researches and experiments in agriculture.

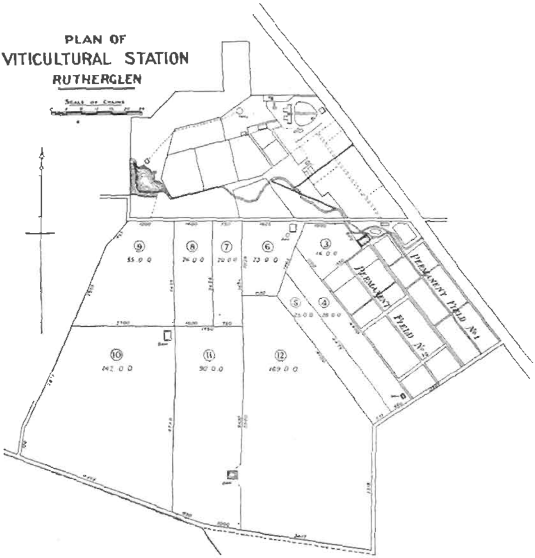
The primary purpose of the farm is not to attain financially profitable results so far as the farm itself is concerned, but to assist the agricultural

practice of the North-east by the prosecution of investigations and trials under practical and accurately recorded conditions concerning the problems involved in increasing the agricultural output of the State, particularly as regards—

(1) Improvement of wheat and other cereals, and economic plants by selection, stud-breeding, and hybridizing.

(2) Soil renovation, soil fertilization, and tillage methods.

(3) Rotation of crops and improved cropping practices.



Plan 1.—The Rutherglen Experiment Farm.

(4) Improvement of natural pastures.

(5) Research concerning soil moisture, soil temperatures, and bi logical conditions, and the nutrition of plants.

(6) *Meteorological observations relating to agriculture.*

The Farm Area (Plan 1).

The Farm area comprises about 750 acres, of which the greater portic was heavily timbered land. During the past two years 350 acres have bee

cleared and brought under the plough. At present 285 acres are under cereals, hay, and fodder crops, 210 acres in fallow, and 255 acres in pasture and timbered land. A herd of 20 milking cows and a flock of 250 sheep are kept.

Permanent Experiment Fields (Plan 2).

The Permanent Experiment Fields comprise an area of 105 acres, subdivided into plots varying in size from 1-20th to ½ acre, according to the nature of the investigations in progress. The soil in the Permanent Fields is poor in character, as may be judged both from the nature of the natural pasture and from the chemical analysis of the soil. The poverty of the soil in the Permanent Field, together with its uniform character, make it very suitable for the conduct of experimental work.

Stud Cereal Plots (Section 2) showing acclimatisation tests.

Analysis of the Soil.

Representative samples of the soils and sub-soils at five equidistant points on the Permanent Experiment Field revealed the following average analysis. The analysis of an ordinary good average soil is also given for purposes of comparison :—

—	Nitrogen.	Phos. Acid.	Potash.	Lime.
	%	%	%	%
1. Soil on Permanent Field	·063	·026	·112	·158
2. Subsoil on Permanent Field	·027	·022	·169	·158
3. Composition of an ordinary good average soil	·100	·100	·200	·5–2·0

Summary of Experimental Plots.

The principal experimental work undertaken comprises ten primary sections (Plan 2).—

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DETAILS OF EXPERIMENTAL WORK.

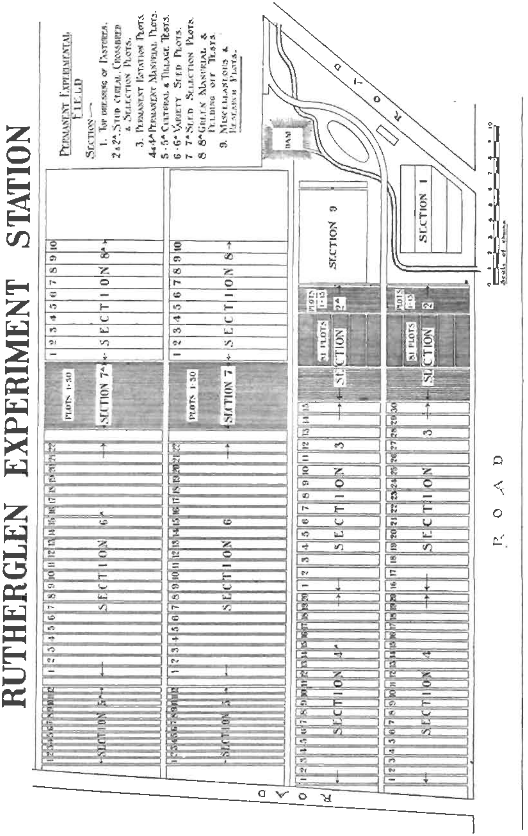
Section 1.—Top Dressing of Natural Pastures.

The object of this section is to test the effects of various fertilizers on the stock carrying capacity of the natural pasture, as compared with untreated pasture. The plots are half acre in area, and each is separately fenced. They are fed off simultaneously each year with sheep, and the length of time a given number of sheep can feed on each plot is carefully noted. Moreover, the sheep are weighed on and off the plots, and the individual and collective increases in live weight on each plot are obtained and compared with the untreated plot. Positive results as to the net monetary returns from the respective applications will thus be obtained.

The plots comprise—

(1) Superphosphate (1 cwt. applied in 1912, 1 cwt. applied in 1913).
(2) No manure.
(3) Thomas' phosphate, 2 cwt. per acre applied in 1913 only.
(4) Superphosphate, 2 cwt., and lime, 10 cwt., per acre applied in 1913 only.

The feeding off of these plots is now in progress. Before generalizations can be drawn it will be necessary to conduct the experiment for some years. Remarkable differences, however, are already showing in the amount and quality of the pasture on the plots resulting from these top dressings.



Plan 2.—Rutherglen Experiment Farm.

Thus, to the eye at the present time, the line of demarcation between Plot 4—treated with superphosphate and lime and the untreated area outside the plot—is most marked. Noted also is the free growth of trefoils and clovers and the vigour of the grasses consequent on the top-dressing with phosphates and lime.

Section 2.—Improvement of Cereals.

Stud Cereals.

(*a*) This section comprises a series of small plots devoted to stud wheats, barleys, oats, and new cross-bred wheats. A complete collection of standard Australian varieties has been sown. These form the stud plots for improvement by selection and cross-breeding.

Acclimatisation Plots.

(*b*) A large number of foreign varieties of wheat, barley, and oats have been obtained by exchanges with Departments of Agriculture and Experiment Stations in America, Canada, India, Russia, and Germany. It is anticipated that some of these varieties, after acclimatisation, will be of direct value and worthy of wider trial in the State. Several acclimatised foreign varieties, *e.g.*, White Fife, Minnesota 163, and American 8 may be seen growing in Section 7—Selection Plots. It is anticipated, however, that these varieties will be of considerable value indirectly as a means, through cross-breeding, of improving local varieties in specific characteristics, *e.g.*, early maturity, milling quality, drought resistance, rust resistance, &c.

Selection Plots.

(*c*) Ninety small plots have been set aside for the testing of different methods of selection as applied to cereals, and comprise tests of mechanical grading, statistical variation measurements, and head group trials.

Cross-bred Plots.

(*d*) A number of new cross-bred varieties are growing in this section. These are in all stages of development from the first to the fifth generation. The latter cross-breds (now fixed) are now undergoing competitive trials in long rows alongside standard wheats like Federation, and, if the comparison is favorable, the new wheats will be given a trial on a larger scale alongside the best local varieties. Section 2A has been under peas this season, and will be utilized for this section next year

Section 3.—Permanent Rotation Tests.

The Permanent Rotation Tests comprise a series of 30 plots designed to test the merits of various systems of cropping under the conditions which prevail in the district. The experiments may be described as a test of eleven different systems of farming, of which only three are practised in the district. The plots are permanent, and comprise the following :—

1.—*Wheat after bare fallow.*

Plot 1.—Wheat 1912,	bare fallow 1913,	wheat 1914, bare fallow 1915.	
,, 2.—Bare fallow 1912,	wheat 1913,	bare fallow 1914, wheat 1915.	

2.—*Wheat after leguminous forages.*

Plot 3.—Wheat 1912,	peas 1913,	wheat 1914,	peas 1915.
,, 4.—Peas 1912,	wheat 1913,	peas 1914,	wheat 1915.

3.—*Wheat after non-leguminous forages.*

Plot 5.—Wheat 1912,	rape 1913,	wheat 1914,	rape 1915.
,, 6.—Rape 1912,	wheat 1913,	rape 1914,	wheat 1915.

View of Permanent Rotation Tests (Section 3) showing plots in a five-course Rotation.

4.—*Wheat after forages.*

Plot 7.—Wheat 1912,	rape 1913,	peas 1914,	wheat 1915.
,, 8.—Rape 1912,	peas 1913,	wheat 1914,	rape 1915.
,, 9.—Peas 1912,	wheat 1913,	rape 1914,	peas 1915.

5.—*Wheat after forage, barley, and legumes.*

Plot 10.—Wheat 1912,	peas 1913,	barley 1914,	peas 1915.
,, 11.—Rape 1912,	barley 1913,	peas 1914,	wheat 1915.
,, 12.—Barley 1912,	peas 1913,	wheat 1914,	rape 1915.
,, 13.—Peas 1912,	wheat 1913,	rape 1914,	barley 1915.

6.—*Wheat after rye and vetches.*

Plot 14.—Wheat 1912, rye and vetches 1913, wheat 1914.
,, 15.—Rye and vetches 1912, wheat 1913, rye and vetches 1914.

7.—*Wheat continuously.*

Plot 16.—Wheat 1912, 1913, 1914, and 1915.

8.—*Wheat after sorghum.*

Plot 17.—Wheat 1912, sorghum 1913, wheat 1914, sorghum 1915
,, 18.—Sorghum 1912, wheat 1913, sorghum 1914, wheat 1915.

9.—*Wheat after bare fallow and pasture* (the Mallee Rotation).

Plot 19.—Wheat 1912,	pasture 1913,	bare fallow 1914, wheat 1915.
,, 20.—Pasture 1912,	bare fallow 1913,	wheat 1914, pasture 1915.
,, 21.—Bare fallow 1912,	wheat 1913,	pasture 1914, bare fallow 1915.

10.—*Wheat after forages, fallow, and legumes.*

Plot 22.—Wheat 1912,	corn 1913,	peas 1914,
	barley 1915,	bare fallow 1916.
,, 23.—Corn 1912,	peas 1913,	barley 1914,
	bare fallow 1915,	wheat 1916.
,, 24.—Peas 1912,	barley 1913,	bare fallow 1914,
	wheat 1915,	corn 1916.
,, 25.—Barley 1912,	fallow 1913,	wheat 1914,
	corn 1915,	peas 1916.
,, 26.—Bare fallow 1912,	wheat 1913,	corn 1914,
	peas 1915,	barley 1916.

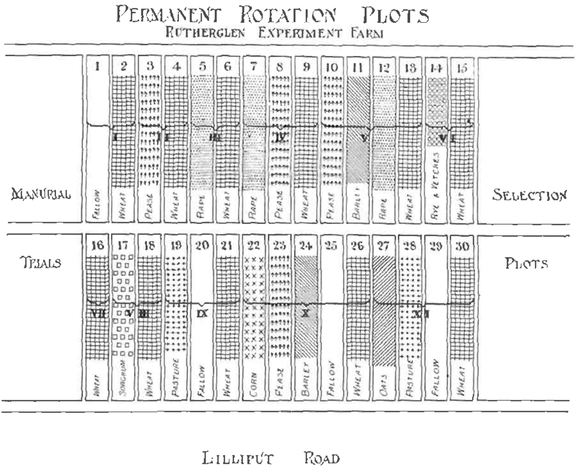
11. *Wheat, oats, pasture, bare fallow* (the Wimmera Rotation).

Plot 27.—Wheat 1912,	oats 1913,	pasture 1914, bare fallow 1915.
,, 28.—Oats 1912,	pasture 1913,	bare fallow 1914, wheat 1915.
,, 29.—Pasture 1912,	bare fallow 1913,	wheat 1914, oats 1915.
,, 30.—Bare fallow 1912,	wheat 1913,	oats 1914, pasture 1915.

NOTE.—Dates of sowing seed and manure, *Rotation Plots* 1913:—

Wheat Plots, sown 17th May. 60 lbs. seed per acre. 1 cwt. super.
Barley Plots, sown 19th March. 72 lbs. seed per acre. 1 cwt. super.
Oat Plot, sown 17th May. 2 bushels seed per acre. 1 cwt. super.
Rye and Vetches, sown 19th March. Rye, 21 lbs., Vetches, 42 lbs. per acre. 1 cwt. super.
Rape Plots, sown 19th March. Rape, 6 lbs., and Mustard, 1 lb. per acre. 1 cwt. super.
Peas Plots, sown 19th May. 120 lbs. per acre. 1 cwt. super.
Maize Plots, sown 14th October.
Sorghum Plots, sown 14th October.

Careful records are being kept of the cost of treatment given to each plot in the Rotation Field. As far as it is possible, each crop received the same treatment it would get if it were growing on a large area, and as if it were the main crop of the district. The object is to find out the most profitable form of rotation in a district with a 20-in. rainfall, and to discover whether it is not possible to improve upon the orthodox wheat, pasture, and bare fallow system of rotation. The most profitable rotation will be that which continues to yield the best financial returns throughout a series of years.



Plan 3.—Rutherglen Experiment Farm.
Permanent Rotation Plots.

This will be determined by the keeping of accurate records in which the cost of working each plot will be entered at current market rates, and it may be assumed that whatever holds true on the Permanent Rotation Field will also be true if applied to, say, 100 acres. To facilitate the calculation of the grazing values of the fodder crops and stubble in each rotation, the plots have been fenced, and records of the number of sheep grazed on each plot may thus be obtained.

Section 4.—Permanent Fertilizer Trials.

These comprise a series of 40 quarter-acre plots, of which, in any one year, 20 are in crop and 20 are either fallowed or under forage crops.

The plots are to be permanent, *i.e.*, the same manurial treatment will be continued on each plot for a number of years.

The following table gives the scheme of the plots :—

Plot 1.—Farmyard manure, 10 tons per acre.
,, 2.—Farmyard manure, 10 tons per acre, and lime, 10 cwt. per acre.
,, 3.—No manure.
,, 4.—Superphosphate, ½ cwt. per acre.
,, 5.—Superphosphate, 2 cwt. per acre.
,, 6.—Superphosphate, 1 cwt. per acre.
,, 7.—Guano, 1 cwt.
,, 8.—Superphosphate, 1 cwt. per acre; nitrate of soda (in spring), ½ cwt. per acre.
,, 9.—Superphosphate, 1 cwt. per acre; sulphate of ammonia, 44 lbs.
,, 10. Superphosphate, 1 cwt. per acre; sulphate of ammonia, 44 lbs.; potash, ½ cwt.
,, 11.—No manure.
,, 12.—Bonedust, 1 cwt. per acre (phosphate content equal to Plot 6).
,, 13.—Thomas' phosphate, 1 cwt. per acre; (phosphate content equal to Plot 6).
,, 14.—Thomas' phosphate, ½ cwt.; super., ½ cwt.
,, 15.—Super., 1 cwt.
,, 16.—Super., 1 cwt.; lime, 5 cwt.
,, 17.—Super., 1 cwt.; lime. 10 cwt.
,, 18.—Super., 1 cwt.; lime, 20 cwt.
,, 19.—No manure.
,, 20.—Super., 1 cwt.; sulphate of potash, ½ cwt.

In 1912 the variety of wheat used was Zealand Blue on all the plots. This variety was badly affected by the late frosts last season, and the land was foul with weeds through being out of cultivation for some years. Nevertheless, the results were interesting, though the average yields were low, in consequence of the causes referred to.

The following table illustrates the principal results in 1912 :—

Treatment.	Yield.	Increase over Unmanured Plot.	Value of Increased Yield.	Cost of Manure per Acre.	Net Gain or Loss per Acre.
	Bushels.	Bushels.	£ s. d.	£ s. d.	s. d.
No Manure	11·4	..	..	..	..
Super., ½ cwt.	14·4	3·0	0 10 0	0 2 6	7 6 gain
Super., 1 cwt.	16·2	4·8	0 16 0	0 5 0	11 0 ,,
Super., 2 cwt.	18·7	7·3	1 4 0	0 10 0	14 0 ,,
Bonedust, 1 cwt.	13·8	2·4	0 8 0	0 6 9	1 3 ,,
Thomas' Phosphate, 1 cwt.	13·9	2·5	0 8 4	0 4 9	3 7 ,,
Super., 1 cwt.; Lime, 5 cwt.	17·4	6·0	1 0 0	0 13 9	6 3 ,,
Super., 1 cwt.; Lime, 10 cwt.	18·3	6·9	1 3 0	1 2 6	0 6 ,,
Super., 1 cwt.; Lime, 20 cwt.	20·2	8·8	1 9 4	2 0 0	10 8 loss

In these calculations superphosphate is reckoned at 5s. per cwt. on the farm ; burnt lime, 35s. per ton ; Thomas' phosphate, 4s. 9d.; and bonedust, 6s. 9d. per cwt. on the farm. It is too early, of course, to draw any conclusions from these plots ; but it would appear from the above table, confirmed by the appearance of the crops on the fertilizer plots this year, that lime is likely to be of value in the North-East District for wheat crops, to say nothing of legumes and forages.

It must not be expected, of course, that the full effect of the lime would be observable during the first year. It is reasonable to suppose that the heavier dressings would continue to influence the crop for a number of years, and, therefore, the whole of the cost should not be charged against the crop the first year. In 1912 the crops were grown on Section 4A. This season they

Permanent Fertilizer Plots (Section 4) showing effect of a dressing of lime.

are situated on Section 4. Next season, when Section 4A comes under crop for the second time, the indirect or cumulative effect of the lime will be noted.

Another suggestive result from this experiment is that the heavy dressings of superphosphate give higher net returns per acre than the lighter dressings. Here, again, inferences must not be drawn too hastily. But even if the same net return were obtained from heavy as light, the former would be the more advantageous, for the farmer would be enriching his land in phosphoric acid without extra cost.

The permanent character of these plots make them more important than the usual fertilizer trials. On every occasion on which these plots come under crop the manurial dressing applied to each will be the same. The effects due to the different dressings of fertilizers will become more noticeable as the years go by, and interesting changes in the fertility of the soil in the various

plots may be looked for. Thus it will not only be possible to determine the immediate effect of the various fertilizers, but the cumulative effect as well, and the general influence of each fertilizer on the quality and stock-carrying capacity of the resultant pasture.

Note.—All wheat plots on this section were sown on 8th May, 1913, with Federation seed at the rate of 61 lbs. per acre. Lime applied to plots 2, 16, 17, and 18, 4th April, 1913. Stable manure spread 2nd April.

Section 5.—Cultural and Tillage Tests.

These comprise a series of 24 permanent plots, of which one-half are in crop in any one year. The object of the tests is to find out the comparative net returns when land of uniform quality is cultivated in various ways. The following plots have been provided for:—

Plot 1.—Ploughed 3 inches deep in July and cultivated through the summer.
,, 2.—Ploughed 5 inches deep in July and cultivated through the summer.
,, 3.—Ploughed 7 inches deep in July and cultivated through the summer.
,, 4.—Ploughed 9 inches deep in July and cultivated through the summer.
,, 5.—Ploughed 3 inches and sub-soiled and cultivated through the summer.
,, 6.—Ploughed 5 inches and sub-soiled and cultivated through the summer.
,, 7.—Ploughed 7 inches and sub-soiled and cultivated through the summer.
,, 8.—Ploughed 5 inches in July and cultivated through the summer.
,, 9.—Ploughed 5 inches in July and left until seed time.
,, 10.—Ploughed 5 inches in October and cultivated through the summer.
,, 11.—Ploughed 5 inches in October and left until seed time.
,, 12.—Ploughed 5 inches just before seed time.

Section 5a will be sown next season. For 1913, each plot was sown with Federation seed, at the rate of 61 lbs. per acre, and 1 cwt. superphosphate.

Section 6.—Variety Wheat Trials.

These consist of 22 plots, of which three are check plots of Federation. The object of this plot is to provide pure selected seed for the Bulk Seed Plots next season, and also to serve as a trial of the value of each variety under local conditions. The plots are of ·45 acres each in area, and have received precisely similar treatment. The following varieties have been sown:—

Plot 1.—Federation.
,, 2.—Yandilla King.
,, 3.—Genoa.
,, 4.—American 8.
,, 5.—Huguenot.
,, 6.—Dart's Imperial.
,, 7.—Zealand Blue.
,, 8.—Marshall's No. 3.
Plot 9.—Triumph.
,, 10.—White Tuscan.
,, 11.—Federation.
,, 12.—Bobs.
,, 13.—Warren.
,, 14.—Bayah.
,, 15.—Viking.
Plot 16.—Firbank.
,, 17.—Thew.
,, 18.—Bunyip.
,, 19.—College Eclipse.
,, 20.—Gluyas.
,, 21.—King's Early.
,, 22.—Federation.

Section 7.—Selection Plots.

This section comprises 28 varieties of wheat with three check plots of Federation for comparative purposes.

The seed for these plots was obtained by careful hand selection in the field of the best heads of the best plants of last season's selection plots. The process of selection is repeated year by year, the product of the selection being utilized for the succeeding year's selection plot, whilst the rest of the wheat is harvested and sown on the variety plots. The variety plot in its turn provides seed for the bulk plots, the product of which is distributed as seed

Hay crop, average height, 6 ft. 6 in., Rutherglen Experiment Farm.

for farmers. The following varieties are undergoing trial on this section. Brief notes are appended regarding their qualities :—

1.—FEDERATION—One of the most prolific and popular varieties of wheat cultivated at the present day. A cross-bred wheat produced by Farrer of New South Wales. Essentially a grain yielder. Upstanding straw, dark bronze beardless, with a well compacted head.

2.—YANDILLA KING—A well-known late variety, stools wells, and is one of the best grain-yielding varieties in cultivation. Somewhat difficult to strip.

3.—GENOA—A late, smut-resistant cross-bred variety produced by Farrer. Suited for the colder districts of the State.

4.—AMERICAN 8—A vigorous tall-growing variety, of good stooling capacity. A promising wheat, both for grain and hay purposes. Bronzed beardless head with dark shotty grain. Gave excellent yields at Rutherglen last season, both of hay and grain.

5.—HUGUENOT—Originated by Correll of Western Australia. Tall-growing variety of the Durum or Macaroni class of wheats.

Stools badly, and needs to be sown fairly thick. The hay is solid in the straw, and is very sweet and palatable and much relished by stock. Beardless, bluish-black head, with dense crowded spikelets. Has given very heavy yields of hay.

6.—Dart's Imperial—One of the oldest and most popular dual purpose varieties of the Purple Straw type. Somewhat late variety, with dark foliage, stools well, and gives good yield of grain and hay. Head white and beardless, slightly awned and compact at the tip.

7.—Zealand Blue—Produced by Berthand of Western Australia under the name of Cross-bred 53. A late variety, suitable for hay. Ears long and beardless with woolly chaff.

8.—Marshall's No. 3.—A very popular late variety, largely grown both for grain and hay in Victoria, New South Wales, and South Australia.

9.—Triumph—A vigorous tall-growing variety, with good stooling propensities. Somewhat early, and very suitable for hay.

10.—White Tuscan—A very popular hay wheat, giving a heavy cut of good quality hay. Retains its colour well. Good stooling propensities, and very late. Not a heavy grain yielder.

11.—Federation—(*Vide* Plot 1.)

12.—Bobs—A hybrid wheat produced by Farrer by crossing Nepaul barley with Lambrigg wheat. A mid-season variety of excellent milling quality; suited to coastal districts. Large open, beardless, white heads carrying small hard shotty grain.

13.—Warren—A vigorous grower, suitable for forage, hay, or grain. Has done well in the coastal districts of New South Wales, and has a good reputation for rust resistance.

14.—Bayah—A mid-season variety, very similar to Federation, with its short upstanding straw and bronzed head; more compact than Federation, and slightly awned.

15.—Viking—An early variety, grown extensively for grain in South Australia.

16.—Firbank—One of the most popular hay wheats in the Riverina, and for some years past the demand for seed of this variety has been unprecedented. An early, tall-growing, erect grower, of moderate stooling capacity. Gives a heavy cut of good quality hay. Susceptible to flag smut.

17.—Thew—A very early, tall-growing wheat, with a long tapering beardless head. Suitable for hay in dry districts.

18.—Bunyip—A very early variety, suitable for sowing in dry districts when the season is late.

19.—College Eclipse—An early maturing variety, obtained by selection from Carmichael's Eclipse, which latter is very widely grown in the wheat areas of South Australia.

20.—Gluyas—A popular wheat in the Mallee Districts of South Australia on account of its early maturity, rust resistance, and drought resistance. A vigorous grower, but somewhat

weak in the straw, and tends to go down. This variety holds the grain well. Ears beardless, dark brown and pendent when ripe.

21.—KING'S EARLY—A tall-growing variety, with semi-solid straw. Very popular in the dry districts of South Australia. It is bearded, but in spite of its beard it is prized as a hay wheat on account of the sweetness of the hay and the capacity to retain its colour well. Straw, semi-solid in character, weighs well.

22–23.—COMMONWEALTH and CURRAWA—Two new cross-bred wheats recently produced by Mr. H. Pye of Dookie College. These varieties are very promising, and have done well in trials in various parts of the State.

24.—CLEVELAND—A late variety, with good stooling capacity, suitable for hay and grain production in the moister districts of the State.

25.—GAMMA—A good stooling, late variety, of considerable promise.

26.—JONATHAN—One of Farrer's cross-bred wheats. A mid-season variety, with beardless, tapering, compact ears. Grain of high milling quality. Holds the grain well and very difficult to strip.

27.—WHITE FIFE—A late variety, with great stooling propensities. Very popular in Canada. During the past five years it has been free from rust. Gives a heavy yield of hay. An excellent milling wheat and likely to be suitable for late districts.

28.—MINNESOTA 163—Originated by the Minnesota Experiment Station, and is one of the most prolific varieties grown in Minnesota, U.S.A.

29.—PURPLE STRAW—One of the oldest varieties grown; was formerly very widely grown, but has now been largely superseded by Federation, which was obtained by crossing Yandilla with Purple Straw. Selections of this variety are still grown under various local names.

30.—FEDERATION—Check plot (*vide* Plot 1).

Section 8.—Green Manurial and Feeding-off Tests.

The object of this experiment is to determine the most practical and economic method of renovating the soil and of increasing the organic matter, which is the basis of soil fertility and productivity.

Twenty plots, of ½ acre each, have been laid out, and in any year ten plots will be sown to wheat, and ten with various forages for feeding off and ploughing in. The forages at present undergoing trial are rape, barley, peas, and rye and vetches. Each of these forages is grown in duplicate plots, of which one plot is regularly ploughed in and one regularly fed off.

By alternating the ten forage plots with the ten wheat plots each year, comparative results will be obtained of the value of wheat after each of the forages when fed off as compared with wheat following the same forages ploughed in. Comparisons may also be made with the orthodox wheat after bare fallow.

The following is the scheme of the plots :—

Plot.	1913.		Plot.	1914.	
1.	Rape	Ploughed in	1.	Wheat	
2.	Barley	Ploughed in	2.	,,	
3.	Peas	Ploughed in	3.	,,	
4.	Rye and Vetches	Ploughed in	4.	,,	
5.	Bare Fallow		5.	,,	
6.	Rape	Fed off	6.	,,	
7.	Barley	Fed off	7.	,,	
8.	Peas	Fed off	8.	,,	
9.	Rye and Vetches	Fed off	9.	,,	
10.	Bare Fallow		10.	,,	
11.	Wheat		11.	Rape	Ploughed in
12.	,,		12.	Barley	Ploughed in
13.	,,		13.	Peas	Ploughed in
14.	,,		14.	Rye and Vetches	Ploughed in
15.	,,		15.	Bare fallow	
16.	,,		16.	Rape	Fed off
17.	,,		17.	Barley	Fed off
18.	,,		18.	Peas	Fed off
19.	,,		19.	Rye and Vetches	Fed off
20.	,,		20.	Bare Fallow	

Thus, in the first four plots, Nos. 1, 2, 3, 4 (1913), and 11, 12, 13, 14 (1914), the whole of the forage crops will be sacrificed for the benefit of future wheat crops, whilst in the case of plots Nos. 6, 7, 8, 9 (1913), and 16, 17, 18, 19 (1914),

Farmers inspecting Permanent Rotation Plots (Section 3).

some immediate return will be obtained, for these plots will be fed off by sheep. In the former case the cost of production and ploughing under of the green crop must be debited to the wheat crops, whilst in the latter case the value of the forage fed off will be estimated and taken into consideration.

Feeding-off Records.—While increased crops of wheat may result from the ploughing in and feeding off of forage crops, as compared with bare fallow or systems of continuous cropping with cereals, it would be of little advantage to the farmer if the increase of crop were insufficient to cover the extra cost of working the land. Accordingly, efforts are being made to estimate the exact value of the green forage fed off by conducting properly-controlled feeding trials with sheep, and placing the forage value against the increased

cost of cropping. For this purpose, as many young sheep are turned on the plots as will properly utilize the fodder. The sheep are individually weighed on and off the plot, and the increase of live weight noted. For every increase of 1 lb., 1½d., say, will be allowed, according to the market value at the time. Further, an allowance of 1½d., say, per head per week for the wool will be made, irrespective of the increase in live weight. Thus comparative values will be established for each of the forage crops fed off and those values set against the cost of production.

Section 9.—Miscellaneous Plots.

1. WHEAT AFTER FORAGES FED OFF.

Five plots, of ½ acre each, were sown last season with rape, barley, pease, rye and vetches, and berseem. Each of these plots were fed off with sheep and the increase of live weight of the sheep during the progress of the experiment determined. This season all five plots are under Federation wheat. Thus, a comparison will be obtained of the value of wheat when

View of Green Manurial and Forage Tests (Section 8), showing method of feeding off barley and rape plots in small sections.

sown after each of these forages. The following table gives the results of last season's tests :—

TABLE I.—FEEDING-OFF TESTS, 1912.

No. and Plot.	No. of Sheep on Plot.	Weight of Sheep on Plot.	Weight of Sheep off Plot.	Increased Live Weight of Sheep per Plot.	Days on Plot.	Increase of Live Weight of Sheep per Acre.
		lbs.	lbs.	lbs.		lbs.
1. Rape	19	1,381	1,742	361	21	722
2. Rye and Vetches	19	1,363	1,603	240	21	480
3. Pease	25	2,451	2,607	156	14	312
4. Barley	19*	1,326	1,635	309	25	658
	5†	480	500	20	14	
5. Berseem	10	1,001	1,101	105	14	210

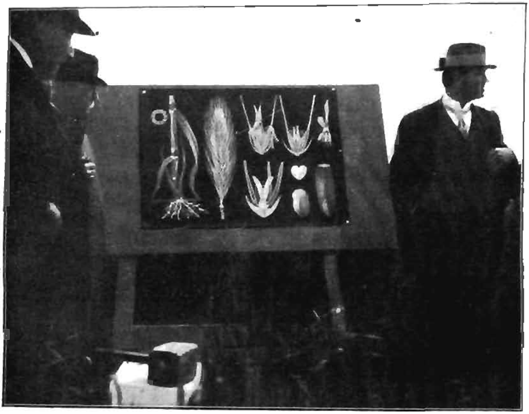
* First feed. † Second feed.

2. Nitrification Tests and Soil Moisture Tests.

Four plots have been laid out in Field No. 2 adjacent to the Cultural Tests. Soil samples are taken each month from four plots—(*a*) worked fallow, (*b*) neglected fallow, (*c*) pasture land, and (*d*) cropped land. The amount of moisture and nitrate nitrogen in the soil at varying depths is determined by analyses.

3. Water requirements of Crops.

Within the railed enclosure in this section are a series of pot tests for determining the total amount of water required by wheat, barley, oats, rape, and peas at various stages of growth from germination to maturity. These



Agricultural Superintendent (Mr. A. E. V. Richardson) giving Field Demonstration of methods of improving cereals.

pots are weighed regularly every week, and by calculation the exact amount of water utilized by each crop at each and every stage of its growth can be accurately determined. Incidentally, these tests will demonstrate how much water must actually pass through the roots, stems, and leaves (by transpiration) of our common farm crops under Australian conditions in order to build up a given amount of dry matter—say, a ton of hay, or a 20-bushel crop of wheat. Check pots in fallow are provided for comparative calculations. A similar experiment is being carried out at the Central Research Farm, Werribee.

4. Meteorological Records.

Within this enclosure may be seen the arrangements and instruments for taking the following meteorological records :—

1. Daily maximum and minimum air temperatures.
2. Daily humidity of the air.
3. Daily evaporation.
4. Maximum and minimum soil temperatures at a depth of 1 inch, 6 inches, 12 inches, and 24 inches.
5. Amount of bright sunshine each day.
6. Daily rainfall.

View of Bulk Wheats for Seed (Section 10) Rutherglen Experiment Farm.

Rutherglen Experiment Station.

Rainfall and Evaporation Observations.

The following table gives details of the average rainfall for thirteen years, the monthly rainfall and evaporation for 1913 :—

Month.	Average for 13 years.	Rainfall for 1913.	Evaporation for 1913.
	inches.	inches.	inches.
January	1·12	1·48	7·900
February	1·09	1·09	7·670
March	2·18	3·95	5·250
April	1·22	·11	3·235
May	1·94	2·35	1·975
June	2·86	1·87	1·115
July	2·56	·53	1·190
August	1·99	1·58	2·036
September	1·95	2·88	2·631
October	1·75	1·83	4·135
November..	1·52	..	..
December	1·63	..	..
Total	21·81	..	..

Section 10.—Bulk Wheats for Seed.

These comprise a series of eighteen varieties of wheat sown in blocks varying from 2½ acres up to 30 acres.

The wheats in this series are true to type and the produce is intended for distribution, in small lots, to farmers, so that plots may be sown by each to furnish his own bulk seed the following year. The seed for the bulk wheat section will be obtained each year from the select-bred wheat on the variety section, which in its turn is obtained from the selection plots where the seed is hand selected year by year. Thus, by a process of continuous and uninterrupted selection applied systematically in the selection plots, the wheat of the bulk seed plots will gradually improve, since they will be derived from plots in which the elite plants of the crop have been regularly selected year after year.

By so maintaining the type, and consciously endeavouring to improve it, the deterioration of wheat varieties, which has been so common an occurrence, may be obviated. The varieties grown in the bulk section are the following:—

Plot 1.—Huguenot.
,, 2.—Zealand Blue.
,, 3.—Marshall's No. 3.
,, 4.—Viking.
,, 5.—College Eclipse.
,, 6.—Bearded Gluyas.
,, 7.—Zealand.
,, 8.—Penny.
,, 9.—Firbank.
Plot 10.—Yandilla King.
,, 11.—Dart's Imperial.
,, 12.—American 8.
,, 13.—Bunyip.
,, 14.—King's Early.
,, 15.—Gluyas.
,, 16.—Bayah.
,, 17.—Genoa.
,, 18.—Federation.

Section 11.—Viticultural Experiments.

(Notes by G. H. Adcock, F.L.S.)

To those who are practically interested in the viticultural industry an inspection of the experiments in the vineyard and cellar will prove of more than a passing interest. The greater portion of the area under vines is devoted to the growth of the American phylloxera-resistant vines for providing stocks for grafting. Reconstitution on these stocks has proved the only satisfactory means of combatting the ravages of phylloxera. The wood obtained from these "Mother Stocks" as they are called, is utilized at the nursery at Wahgunyah for the grafting of wine, table, and drying varieties. In addition, there is a limited area of reconstituted commercial vineyard on the very site of a vineyard destroyed by phylloxera. From these vines a gross return of £50 per acre has actually been obtained. These results are the more striking when it is remembered that the land on which these vines are planted was originally most unpromising and indifferent, but has been considerably improved.

Green manuring, fertilizing, and pruning tests are regularly conducted at this Station. A considerable space is also devoted to the growth and trial of vines of recent introduction. These, it is confidently anticipated, will improve the quality and increase the yields of Victorian vineyards. One of these new varieties at last vintage gave a return of over 8 tons of grapes to the acre.

A most instructive and interesting series of experiments is in the making of wines separately from these new varieties. Over 30 types of wine were thus made at last vintage. These have invariably won the highest commendation from judges at public tastings, and give vignerons a practical idea of the capabilities of these recent importations. Experiments with pure cultures and sulphiting are also carried out.

A section is devoted to the determination of the adaptability of the different stocks to the varied soils, and also their grafting affinity to the various scions employed.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART X.—PACKING—*continued.*

(*Continued from page 754, Vol. XI.*)

By E. Meeking, Senior Fruit Inspector.

A PLEA FOR THE INTRODUCTION OF THE DIAGONAL-NUMERICAL SYSTEM OF PACKING APPLES—*continued.*

FURTHER COMPARISON OF NUMERICAL AND BUSHEL STANDARDS.

Many of our exporters contend that in the United Kingdom, where apples are retailed by weight, the bushel standards furnish a better criterion for the guidance of purchasers than do the numerical standards. Many consider that a case marked, say, "Jonathan apples, 2½ inches, one bushel net," should furnish an ideal trade description for a purchaser in a country where apples are sold by weight. At first sight this contention would appear to be correct, but it is not so in actual fact, for the reason that in the great majority of instances such case, not having been packed under a fixed system, would not contain apples of 2½ inches in diameter throughout; but would contain apples varying from 2⅜ inches to 2⅝ inches in diameter. The case would thus contain apples of three grades, viz., 2⅜ inches, 2½ inches, and 2⅝ inches. The retail purchaser would, therefore need to sort the case into its various grades before offering the fruit for sale to the public, as the apples, although retailed by weight, would vary in value according to size and general quality. For instance, all other things being equal, a pound of Jonathan apples 2⅝ inches in diameter would vary in value from a pound of Jonathan apples 2⅜ inches in diameter.

It may be said that the difficulty could easily be overcome by insisting that the trade description must be in accordance with fact, and a case bearing a statement that apples of 2½ inches in diameter are contained therein, should contain only apples of exactly 2½ inches. This remedy is not so easy to apply as it would appear, as our packers,

not having learnt to grade under systematic methods, have not acquired the "sense," if it may be so called, of grading as thoroughly as the numerical system demands, and although in all other respects they compare more than favorably with packers elsewhere, in the matter of "size" grading, they have much to learn. The words "size grading" are used because it must be understood that in Canada and the United States the word "grade" includes meanings other than that relating to the sizes of fruits. Under the Canadian Fruit Marks Act, for example, apples are divided into four grades or qualities, viz., Fancy quality; No. I. quality; No. II. quality; and No. III. quality. These grades relate to variety, soundness, colour, growth, shape, packing, and size, the latter having reference only to size in so far as it is demanded that apples must be of at least normal size for the variety, and as the grade marks also demand that cases must be properly packed, it follows, as has already been explained, that when such is carried out under the diagonal-numerical system no latitude is allowed for placing different sized apples in the same case. It is considered here that this Act is not perfect in many respects, but it compels apples to be sold in separate grades, and does not permit packages to be marked with a false trade description.

SOME OPINIONS OF LONDON AND CONTINENTAL BUYERS.

In the *Fruit World* of January, 1912, page 24, a copy of a letter received by Mr. M. G. B. Jefferson, managing director of the Australian Co-operative Export Company, from buyers on the London and Continental markets was published. This letter contained, amongst other information, the following:—

"We have to-day examined this parcel of apples, and find that the quality and condition of the fruit relating to each grade are excellent, with this exception, that some of the fruit appears to be rather shrivelled, or dead, which may suggest that a considerable time elapsed between the picking and the cold-storing of the parcel. The quality of the shipment may be described as "fancy" in each of its grades. If we turn to the packing, however, we find a very different tale, indeed, to tell, and it would appear to us that the packer of these apples, either on his own initiative or through some instructions given him, has come to the conclusion that an apple is not stout enough to stand a journey of considerable length without some soft substance being placed around it to help it to endure the burden put upon it. Hence, we find that packing has been put down the sides of the cases and, in many instances, wadded in between the apples with the intention, presumably, of keeping them steady in their places. The packing of apples is an art, and from a great number of years' experience in the packing sections of the United States and Canada we have come to the conclusion that it is extraordinary how great a pressure can be put upon an apple without doing it any damage, if such pressure is put upon it by an experienced packer. . . . . We see no reason why this packing should be put in the case, as it is useless in itself to help the fruit, and may be looked upon by buyers as a means of deception, because

they believe that apples should be found where this packing is evident. In this particular parcel the packing which has been aimed at is what is called in Oregon and the great box packing States in America as the diamond packing, that is, the cross packing, or diagonal. It is impossible to explain the method of this packing by letter, but sufficient to say here that a sample of it in the parcel we refer to is most irregular and very bad. . . . . We have been in the presence of box packers in America when Tasmanian and Australian apples have been sold, and they have wondered that any value is attached to the package at all in view of the indifferent 'pot luck' kind of packing which is evident. We have seen instances where apples wrapped in paper and shipped from Tasmania and South Australia have been so securely packed that they have been immovable, but in most instances, when opened here after the long voyage, the fruit appears to have been rolled into the boxes. We cannot impress upon your Department too strongly the desirability of having perfectly understood the system of packing adopted in the United States. We are quite sure that, comparing the packing of the parcel we have just had the pleasure of describing with the same parcel, if packed by men we know of, the price of the one parcel would be 1s. to 1s. 6d. per box higher than the other. We sincerely hope that our remarks may be of service to your country in the cultivation of a very great industry."

Replying to inquiries, Mr. J. Martin, jun., Officer in Charge of Fruit Inspection, Department of Agriculture, New South Wales, wrote. on the 8th April, 1912, as follows:—

"Referring to your letter of the 4th inst., I beg to state that the apples from America arrive, as a rule, in good order, and there is far less bruised fruit than in those from Tasmania. When any pressure is brought to bear on the cases the sides expand, which prevents the fruit from getting bruised. I like the case better than those in general use in these States.

"The American fruit is carried long distances by rail in America before it is shipped, and, with ordinary care, stands transhipping well."

Many thousands of these cases are annually imported into Sydney from America, and the above opinion is that of the officer who has been for years in charge of the inspection of these.

Summed up, the chief advantages which the American methods of packing and marketing fruits possess over ours are as follows:—

1. Packing is carried out on systematic lines.
2. Thorough grading of fruits, both as regards size and general quality, is provided for.
3. A safer medium for transportation than ours is ensured.
4. Fruit is packed with a maximum of tightness combined with a minimum of bruising.
5. Standardizing of the timber comprising the cases is more easy of accomplishment.

6. A larger quantity of fruit per ton may be shipped than is possible in the Australian case.
7. Much better prices are obtained on the London and Continental markets for fruits packed under the diagonal-numerical standards.
8. Fuller information for the guidance of purchasers is given.
9. Means for the establishment of a single box retail trade are facilitated.

There seems little room for doubt that the adoption of the diagonal-numerical system of packing, in conjunction with the adoption of the Canadian case, would be a direct benefit both to our local, Inter-State, and oversea export trades. It need not necessarily follow that the Canadian case should be entirely adopted with regard to measurements, as it may be possible that an adaptation of this case for the Australian trade, in order to give the case a distinctive Australian character, would be preferable to adopting the Canadian case as a complete substitute for our present case. This is a matter which *would require some investigation and experimentation before a definite* opinion could be expressed.

(To be continued.)

DAIRYING IN CANADA—

THE annual report of the Canadian Dairy Commissioner calls attention to the fact that while Canada is producing more butter she is becoming yearly a heavier importer of that staple. In 1912 she sent abroad, purely incidentally, 4,256 lbs., while she imported 7,000,000 lbs. Nearly all of these imports come from New Zealand. There is no immediate likelihood of a reduction in the volume of such imports. It is estimated that Canadians are using £8,000,000 worth more of dairy produce than they did 10 years ago. In 1903 the western dairy provinces produced about 300,000 lbs. of creamery butter. Last year the production exceeded 4,000,000 lbs. Yet, while domestic requirements were 500,000 lbs. in 1903, they were 20,000,000 lbs. in 1912. The increased needs are primarily due to a growing population, but in almost equal measure to the use of sweet cream and ice cream. It is believed that the consumption of cream in these two forms last year was equal to 8,000,000 lbs. of butter. The Dairy Commissioner gives strong emphasis in his report to the need for a marked extension of the dairy industry, if Canada is to realize upon her opportunities in that regard. From this it will be seen that there are possibilities of a valuable market for Australian dairy produce in Canada in the near future.—(*The Farmers' Union Advocate.*)

THE ARTIFICIAL MANURES ACTS.

UNIT VALUES FOR 1914.

By P. Rankin Scott, Chemist for Agriculture.

The amending Artificial Manures Act of 1910 requires that manufacturers or importers shall, on or before the 1st November in each year, register the brand of the several fertilizers, and at the same time supply to the Secretary for Agriculture, under declaration, the name and address of manufacturer or importer, the place of manufacture, the raw material from which the manure is manufactured or prepared, a statement of the percentages of nitrogen, phosphoric acid, and potash, together with the respective forms in which they occur, and the retail price per ton. From the information so obtained the unit values of the constituents which have a commercial value are calculated. These unit values so obtained constitute the basis of calculating the values of all manures for the period during which the registered brands continue in force, *i.e.*, until the publication in the *Government Gazette* of the list of registered brands for the following season.

A fixed limit of deficiency is allowed in all fertilizers. (See Schedule hereunder.)

When a manure on analysis is shown to contain less nitrogen, phosphoric acid, or potash than the proportions stated on the label or invoice certificate, to the extent set forth in the Schedule the vendor is liable to a fine of £10 for a first offence, and £50 for any subsequent offence.

Schedule.

Description of Manure.	Percentage of Deficiency allowed in regard to Ingredients of Fertilizing Value.				
	Nitrogen.	Potash readily soluble.	Phosphoric acid. Water soluble.	Phosphoric acid. Citrate soluble.	Phosphoric acid. Citrate insoluble.
All manures containing Nitrogen	0·50				
All manures containing Potash ...	...	1·00			
All manures containing Water Soluble Phosphoric Acid	...	...	1·00		
All manures containing Citrate Soluble Phosphoric Acid ...	...	...	...	1·00	
All manures containing Citrate Insoluble Phosphoric Acid ...	...	...	...	...	1·00

Note.—Provided that the total phosphoric acid deficiency shall not exceed 1·50 per cent.

Regarding the label and invoice certificate referred to above, sections 5 and 7 of the principal Artificial Manures Act of 1904 stipulate that the vendor shall attach to each bag a label or tag declaring the composition of the manure, and shall deliver to all purchasers of manure, at the time of sale, an invoice certificate, conveying similar information to that required to be stated on the label.

From the unit values and the guarantee contained on the tags or invoice certificates, it can be readily ascertained (see method of calculation) whether the price asked for a fertilizer is a reasonable one.

In basing a valuation on mixed manures, by this method of calculation, the price asked generally exceeds the commercial value of the fertilizing ingredients contained in them, the increased cost of these mixed manures represents the cost of mixing, bagging, &c.

REMARKS.

In fixing the unit value, advantage is taken of the respective forms in which the ingredients contained in a manure occur in its composition. Separate values are therefore assigned to nitrogen, phosphoric acid, and potash in their various forms and combinations.

As the average Victorian soil responds to an application of phosphoric acid, manures containing that ingredient in a soluble form are most likely to show the best returns. Superphosphates are, therefore, the most important in that respect, and are the most commonly used, owing to their high water soluble phosphoric acid content. Superphosphates vary, however, in their mechanical condition, and the freedom with which they run through the drill is regulated to a great extent by the fact whether their condition is dry and granular or that of a fine powder and sticky. A good superphosphate should be neither too coarse nor too fine, to avoid clogging the drill, and so cause indifferent spreading. To overcome this difficulty it is customary to mix a small percentage of the untreated ground rock phosphate with the superphosphate; this acts as a drier, and also improves its freedom from clogging; it also partly accounts for the presence in the superphosphate of a certain percentage of insoluble phosphoric acid in the manure. Superphosphates also form the basis of the majority of the mixed manures, and in consequence the greater proportion of their phosphoric acid content is water soluble. Some, however, contain a fairly high percentage of insoluble phosphoric acid, making them of doubtful value when used in the small quantities applied as a dressing. Bonedust is another manure in good demand; it differs from superphosphate in being of animal origin, and contains nitrogen as well as phosphoric acid. Finely ground bonedust will disintegrate quicker in most soils than coarsely ground, and this quality is used in regulating the value, in conjunction with its content of nitrogen and phosphoric acid. Owing partly to its well-known properties as a manure, and also to the supply being limited, manures similar to bonedust, but of inferior quality, are now being sold under the name of bone fertilizers. The better classes of these manures have all the properties of a genuine bonedust, but they are generally reduced in quality by the addition of some foreign substance, such as gypsum. The low-grade bone fertilizers, have for their basis bonedust, but they also contain a certain percentage of phosphoric acid derived from other sources, superphosphate and ground rock phosphate; the latter does not improve the solubility of the manure, but rather tends in the opposite direction. It is customary to state on the label affixed to each parcel of manure, when sold, the source from which an inferior quality ingredient is used in mixing, as in this manure. To distinguish a bonedust from a bone fertilizer, they are guaranteed in a

different manner. Bonedusts state the total nitrogen and phosphoric acid, together with the fine and coarse bone. Bone fertilizer, the total nitrogen and the amount of citrate soluble and citrate insoluble, and total phosphoric acid.

Method of Calculating the Value of a Manure.

The value per ton of a manure sold in Victoria is obtained by multiplying the percentage stated of the nitrogen, phosphoric acid, or potash by the corresponding unit values fixed therefor, and adding the results. As, for example—

Nitrate of Soda—
Invoice Certificate or Tag—

	15·5 per cent. of Nitrogen.		
	£	s.	d.
Nitrate nitrogen, 15·5 x 18s. 9d. =	14	10	7
Value per ton =	14	10	7

Superphosphate—
Invoice certificate or tag—

Phosphoric Acid (Water Soluble) =	17·00 per cent.			
,, ,, (Citrate Soluble) =	1·00 ,,			
,, ,, (Citrate Insoluble) =	2·00 ,,			
,, ,, Total =	20·00 ,,			
		£	s.	d.
Phosphoric Acid (Water Soluble), 17·00 x 4s. 8d.		3	19	4
Phosphoric Acid (Citrate Soluble), 1·00 x 4s. 6d.		0	4	6
Phosphoric Acid (Citrate Insoluble), 2·00 x 2s.		0	4	0
Value per ton		4	7	10

Bonedust—
Invoice Certificate or Tag—

Nitrogen	3·75 per cent			
Phosphoric Acid	21·50 ,,			
Mechanical condition—				
Fine bone	42·50 ,,			
Coarse bone	57·50 ,,			
		£	s.	d.
Nitrogen—Fine bone, $\frac{3\cdot75 \times 42\cdot5}{100}$ = 1·59 per cent. x 15s.		1	3	10
Nitrogen—Coarse bone, $\frac{3\cdot75 \times 57\cdot5}{100}$ = 2·16 per cent. x 13s.		1	8	1
Phosphoric Acid—Fine bone, $\frac{21\cdot5 \times 42\cdot5}{100}$ = 9·14 x 4s. 6d.		2	1	2
Phosphoric Acid—Coarse bone, $\frac{21\cdot5 \times 57\cdot5}{100}$ = 12·36 x 3s. 6d.		2	3	3
		6	16	4

Bone Fertilizer—
Invoice Certificate or Tag—

Nitrogen	3·00 per cent.			
Phosphoric Acid (Citrate Soluble)	3·00 ,,			
Phosphoric Acid (Citrate Insoluble)	12·00 ,,			
Phosphoric Acid (Total)	15·00 ,,			
		£	s.	d.
Nitrogen, 3·00 x 13s.		1	19	0
Phosphoric Acid (Citrate Soluble) 3·00 x 4s. 6d.		0	13	6
Phosphoric Acid (Citrate Insoluble) 12·00 x 2s. 9d.		1	13	0
		4	5	6

Artificial Manures Acts.

UNIT VALUES FOR THE YEAR 1914 AS CALCULATED FROM THE DECLARED PRICES OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE.

	s.	d.
1 per cent. of Nitrogen as Nitrate	18	9
1 per cent. of Nitrogen as Ammonia	15	6
1 per cent. of Nitrogen as Organic in Blood	10	9
1 per cent. of Nitrogen as Organic in Fine Bone	15	0
1 per cent. of Nitrogen as Organic in Course Bone, Animal and Bone Fertilizer	13	0
1 per cent. of Phosphoric Acid as *Water Soluble*	4	8
1 per cent. of Phosphoric Acid as Citrate Soluble	4	6
1 per cent. of Phosphoric Acid as Fine Bone	4	6
1 per cent. of Phosphoric Acid as Course Bone	3	6
1 per cent. of Phosphoric Acid Insoluble in Bone Superphosphate and Thomas Phosphates, and High-grade Fertilizers	3	0
1 per cent. of Phosphoric Acid Insoluble in Low-grade Bone Fertilizers	2	9
1 per cent. of Phosphoric Acid Insoluble in all other Manures	2	0
1 per cent. of Potash as Sulphate	5	8
1 per cent. of Potash as Chloride	4	10

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Mainly Nitrogenous.						
Sulphate of Ammonia	Federal A.S.	20·00	..	..	16 0 0	Australian Explosives and Chemical Co., Melbourne
" "	Sickle	20·00	..	.	16 0 0	Cuming, Smith, and Co., Melbourne
" "	Hasell's	20·00	..	.	15 17 6	A. H. Hasell, Melbourne
" "	M.G. Co.	20·00	..	..	14 0 0	Metropolitan Gas Co., Melbourne
" "	M.L.	20·00	..	..	16 0 0	Mt. Lyell M. and R. Co., Melbourne
" "	Wischer's	20·00	..	..	16 0 0	Wischer and Co., Melbourne
Nitrate of Soda	Federal S.N.	15·50	..	..	14 10 0	Australian Explosives and Chemical Co., Melbourne
"	Sickle	15·50	..	..	14 10 0	Cuming, Smith, and Co., Melbourne
"	Hasell's	15·50	..	..	14 7 6	A. H. Hasell, Melbourne
"	M.L.	15·50	..	..	14 10 0	Mt. Lyell M. and R. Co., Melbourne
"	Wischer's	15·50	..	..	14 10 0	Wischer and Co., Melbourne
Blood	Federal Blood	7·50	1·00	.	6 10 0	Australian Explosives and Chemical Co., Melbourne
"	Champion	11·00	2·00	..	8 10 0	John Cooke and Co. Melbourne
"	Sickle	7·50	1·00	..	6 10 0	Cuming, Smith and Co., Melbourne
"	Hasell's	7·50	1·00	..	6 10 0	A. H. Hasell, Melbourne
"	M C.C.	7·50	1·00	0·41	5 0 0	Melbourne City Council, Melbourne
Blood "A"	M L.	11·00	..	..	10 0 0	Mt. Lyell M. and R. Co., Melbourne
Blood "B"	"	7·50	1·00		6 10 0	" " " "
Blood and Bone	"	6·00	6·20	..	6 15 0	" " " "
Blood	Hercules	11·00	2·00	..	8 10 0	Riverina Meat Co., Melbourne
Blood and Bone	Wilco	7·50	9·50	..	6 10 0	Wimmera Inland Freezing Co., Murtoa
Blood	Wischer's	7·50	1·00	..	6 10 0	Wischer and Co., Melbourne
Mainly Potassic.						
Kainit	Sickle	..	..	12·40	5 0 0	Cuming, Smith, and Co., Melbourne
"	M.L.	..	..	12·40	5 0 0	Mt. Lyell M. and R. Co., Melbourne
"	Wischer's	..	..	12·40	5 0 0	Wischer and Co., Melbourne
Nitrate of Potash	Sickle	13·00	..	44·00	28 0 0	Cuming, Smith, and Co., Melbourne
"	M.L.	13·00	..	44·00	28 0 0	Mt. Lyell M. and R. Co., Melbourne
Potash Chloride (Muriate)	Federal P.M.	..	..	60·00	14 10 0	Australian Explosives and Chemical Co., Melbourne
" "	Sickle	..	..	60·00	14 10 0	Cuming, Smith, and Co., Melbourne
" "	Hasell's	..	..	60·00	14 7 6	A. H. Hasell, Melbourne
" "	M.L.	..	..	60·00	14 10 0	Mt. Lyell M. and R. Co., Melbourne
" "	Wischer's	..	..	60·00	14 10 0	Wischer and Co., Melbourne
Sulphate of Potash, 90 %	Federal P.S.	..	..	48·00	13 10 0	Australian Explosives and Chemical Co., Melbourne
" .. %	"	..	..	51·00	14 12 6	" " " "
" 90 %	Sickle	..	..	48·00	13 10 0	Cuming, Smith, and Co., Melbourne
" 95 %		..	..	51·00	14 12 6	
"	Hasell's	..	..	52·00	14 10 0	A. H. Hasell, Melbourne
" "B"	M.L.	..	..	48·00	13 10 0	Mt. Lyell M. and R. Co., Melbourne
" "A"	"	..	..	51·00	14 12 6	" " "
" 90 %	Wischer's	..	..	48·00	13 10 0	Wischer and Co., Melbourne
" 95 %	"	.	..	51·00	14 12 6	" " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per Ton.	Where Obtainable.
Mainly Phosphoric, Phosphoric Acid readily Soluble.		%	%	%	%	%	%	£ s. d.	
Concentrated Superphosphate	Federal Con. S. ..	..	40·00	4·00	..	44·00	..	12 10 0	Australian Explosives and Chemical Co., Melbourne
,, ,, ,,	Sickle Con. Super.	..	40·00	4·00	..	44·00	..	12 10 0	Cuming, Smith, and Co., Melbourne
,, ,, ,,	M.L. Con. Super	..	40·00	4·00	..	44·00	..	12 10 0	Mt. Lyell M. and R. Co., Melbourne
,, ,, ,,	Wischer's Con. Super.	..	40·00	4·00	..	44·00	..	12 10 0	Wischer and Co., Melbourne
Superphosphate ..	Federal O.S. ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Australian Explosives and Chemical Co., Melbourne
,, ..	Cockbill's ..	..	17·00	1·00	2·00	20·00	..	4 10 0	John Cockbill, Melbourne
,, ..	Florida Sickle ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Cuming, Smith, and Co., Melbourne
,, ..	Hasell's ..	..	17·50	0·50	2·00	20·00	..	4 7 6	A. H. Hasell, Melbourne
Superphosphate, No. 1 ..	M.L.	..	17·00	1·00	2·00	20·00	..	4 7 6	Mt. Lyell M. and R. Co., Melbourne
,, ,, ..	Wischer's ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Wischer and Co., Melbourne
Containing Nitrogen also.									
Nitro Superphosphate ..	Federal N.S. ..	1·10	13·00	1·00	5·00	19·00	..	5 10 0	Australian Explosives and Chemical Co., Melbourne
,, ,, ..	Sickle	1·25	15·30	0·90	2·55	18·75	..	5 10 0	Cuming, Smith, and Co., Melbourne
,, ,, ..	Hasell's ..	1·50	13·00	1·00	3·00	17·00	..	5 8 6	A. H. Hasell, Melbourne
,, ,, ..	M.L.	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Mt. Lyell M. and R.. Co. Melbourne
,, ,, ..	Wischer's ..	1·50	13·38	0·93	2·29	16·60	..	5 10 0	Wischer and Co , Melbourne
Dissolved Bone and Superphosphate	Sickle	1·00	10·01	3·88	5·48	19·37	..	5 10 0	Cuming, Smith, and Co., Melbourne
,, ,, ,,	M.L.	1·00	10·00	3·75	5·25	19·00	..	5 10 0	Mt. Lyell M. and R. Co., Melbourne
Bone, Blood, and Superphosphate	Federal B.B.S. ..	2·62	8·50	0·50	5·00	14·00	..	6 0 0	Australian Explosives and Chemical Co., Melbourne
Bone and Superphosphate	Bugg's	1·75	8·05	7·20	5·05	20·30	..	5 15 0	Fredk. Bugg, Kyneton
Bone and Superphosphate, half-and-half	Cockbill's ..	1·75	12·00	2·00	4·50	18·50	..	5 5 0	John Cockbill, Melbourne
Bone and Superphosphate, one-third and two-thirds	,, ..	1·50	12·75	1·50	4·75	19·00	..	5 5 0	,, ,, ,,
Bone, *Blood, and* Superphosphate, "B"	Sickle	2·62	8·50	0·50	5·00	14·00	..	6 0 0	Cuming, Smith, and Co., Melbourne
Bone and Superphosphate	Magic	1·25	8·00	3·20	5·80	17·00	..	5 2 6	Geo Gardiner and Co., Geelong
Bone, Blood, and Superphosphate	M.L.	2·62	8·50	0·50	5·00	14·00	..	6 0 0	Mt. Lyell M. and R. Co., Melbourne
Dissolved Bones and Superphosphate	Wischer's ..	1·00	13·75	2·62	3·00	19·37	..	5 10 0	Wischer and Co., Melbourne
Bone, Blood, and Superphosphate	,, ..	2·63	8·50	0·50	5·00	14·00	..	6 0 0	,, ,, ,,

Low Grade.									
Bone and Superphosphate	Federal B.S. No. 1	1·50	8·50	0·50	9·00	18·00	..	5 12 6	Australian Explosives and Chemical Co., Melbourne
" " " ..	Federal B.S. No. 3	0·75	12·75	0·75	5·50	19·00	..	5 5 0	" "
Bone and Superphosphate, "A"	Sickle	1·50	8·50	0·50	9·00	18·00	..	5 12 6	Cuming, Smith, and Co., Melbourne
Bone and Superphosphate, "C"	"	0·75	12·75	0·75	5·50	19·00	..	5 5 0	" " " "
Bone and Superphosphate, No. 1	Elsworth's ..	1·00	8·00	3·00	7·00	18·00	.	5 10 0	Wm. Elsworth, Ballarat
Bone and Superphosphate, half-and-half	Hasell's ..	1·50	9·00	1·00	9·50	19·50	.	5 11 6	A. H. Hasell, Melbourne
Bone and Superphosphate, quarter and three-quarters	"	0·80	12·75	1·25	5·50	19·50	..	5 4 0	" "
Bone and Superphosphate, No. 1	M.L.	1·50	8·50	0·50	9·00	18·00	..	5 12 6	Mt. Lyell M. and R. Co., Melbourne
Bone and Superphosphate, No 2	"	0·75	12·75	0·75	5·50	19·00	..	5 5 0	" " " "
Animal Fertilizer and Superphosphate	A.N.A Surprise ..	1·50	7·59	2·50	6·50	16·59	.	5 15 0	G. W. Pennell, Braybrook
Bone and Superphosphate, No. 1	Wischer's ..	1·50	8·50	0·50	9·00	18·00	..	5 12 6	Wischer and Co., Melbourne
Bone and Superphosphate, No. 2	" ..	0·75	12·75	0·75	5·50	19·00	..	5 5 0	" " "
Phosphoric Acid moderately Soluble.									
Thomas Phosphate ..	Federal ..	..	..	14·00	3·00	17·00	..	4 7 6	Australian Explosives and Chemical Co., Melbourne
" " ..	Sickle	..	..	14·00	3·00	17·00	..	4 7 6	Cuming, Smith, and Co., Melbourne
" " ..	Hasell's ..	..	..	14·00	3·00	17·00	..	4 2 6	A. H. Hasell, Melbourne
" " ..	M.L.	..	..	14·00	3·00	17·00	..	4 7 6	Mt. Lyell M. and R. Co., Melbourne
" " ..	Wischer's ..	..	..	14·00	3·00	17·00	..	4 7 6	Wischer and Co., Melbourne

Description of Manure.	Brand	Nitrogen.	Phosphoric Acid.	Mechanical Condition. Fine.	Mechanical Condition. Coarse.	Price asked for the Manure per ton.	Where Obtainable.
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid moderately Soluble.		%	%	%	%	£ s. d.	
Bonemeal	Sickle	3·00	19·00	30·00	70·00	7 0 0	Cuming, Smith, and Co., Melbourne
Bonedust	J.N.D.B. ..	4·23	20·87	33·00	67·00	5 15 0	J. N. Day, Bendigo
"	Hasell's	4·40	19·00	55·00	45·00	7 5 0	A. H. Hasell, Melbourne
"	Jopling's ..	3·00	18·00	50·00	50·00	6 10 0	J. R. Jopling, Ballarat
"	Vauxhall ..	3·86	23·25	33·70	66·30	6 15 0	Wm. Moore, Panmure
Bonemeal	M.L.	3·00	19·00	30·00	70·00	7 0 0	Mt. Lyell M. and R. Co., Melbourne
Bonedust	Whitehorse ..	2·50	24·00	60·00	40·00	5 10 0	F. W. Richards, Warrenheip
"	Rohs	4·00	18·00	55·00	45·00	6 0 0	P. Rohs, Bendigo
"	Marvel	3·74	23·62	36·00	64·00	6 10 0	Spriggs and Porter, Benalla
"	Brown Hill ..	2·50	18·00	30·00	70·00	6 0 0	Turner Bros., Ballarat East
"	Lion	3·85	21·50	31·00	69·00	6 10 0	A. Wray, Sale

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued*.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable
Containing Nitrogen and Phosphoric Acid. Phosphoric Acid difficultly Soluble.		%	%	%	%	%	%	£ s. d.	
Fertilizer	*Lighthouse* ..	7·00	..	4·00	7·00	11·00	..	6 10 0	F. Borthwick and Sons, Portland
Bone Fertilizer	Bugg's	3·58	..	5·67	15·78	21·45	..	6 0 0	S. and F. Bugg, Kyneton
Bone Manure	Cockbill's ..	6·00	..	5·00	10·00	15·00	..	7 0 0	J. Cockbill, Melbourne
Animal Fertilizer ..	Champion ..	5·50	..	5·25	6·25	11·50	..	6 0 0	John Cooke and Co., Melbourne
Bone Fertilizer	*Horseshoe* ..	3·50	..	4·70	10·70	15·40	..	5 15 0	P. Fitzgerald, Bentleigh
,, ,, ...	Magic	5·00	..	3·00	10·00	13·00	..	6 5 0	G. Gardiner, Geelong
,, ,, ...	Eagle	3·25	..	8·95	10·30	19·25	..	6 5 0	E. T. Hoskin, Bairnsdale
,, ,, ...	Echuca	5·12	..	4·15	10·85	15·00	..	6 0 0	Milo Bacon Co., Echuca
,, ,, ...	*Ark*	3·72	..	3·98	12·90	16·88	..	6 0 0	*A. Murphy, Ararat*
Animal Fertilizer ..	Hercules ..	5·50	..	5·25	6·25	11·50	..	6 0 0	Riverina Meat Co., Melbourne
Low Grade.									
Blood and Bone Fertilizer	*Federal B. & B.F.*	*5·00*	..	*3·00*	*12·00*	*15·00*	..	*7 0 0*	*Australian Explosives and Chemical* Co., Melbourne
Bone Fertilizer	Federal B.F. ..	3·00	..	3·00	13·00	16·00	..	6 2 6	,, ,, ,, ,,
,, ,, ...	Cockbill's ..	3·50	..	3·50	14·75	18·25	..	5 10 0	J. Cockbill, Melbourne
Blood and Bone Fertilizer	Sickle	5·00	..	3·00	12·00	15·00	..	7 0 0	Cuming, Smith, and Co., Melbourne
Bone Fertilizer	,, ...	3·00	..	3·00	13·00	16·00	..	6 2 6	,, ,, ,, ,,
,, ,, ...	Elsworth's ..	2·50	..	6·00	11·00	17·00	..	5 15 0	Wm. Elsworth, Ballarat East
Fertilizer, No. 1 ..	Magic	2·00	..	3·60	13·40	17·00	..	5 5 0	Geo. Gardiner and Co., Geelong
Fertilizer, No. 2 ..	,, ...	1·50	..	3·10	12·90	16·00	..	5 0 0	,, ,, ,,
Bone Fertilizer, "A" ..	Hasell's ..	4·25	..	5·00	14·00	19·00	..	7 0 0	A. H. Hasell, Melbourne
Bone Fertilizer, "B" ..	,, ...	3·48	..	3·77	15·43	19·20	..	6 15 0	,, ,, ,,
Bone Fertilizer, "C" ..	,, ...	2·52	..	2·73	15·51	18·24	..	5 15 0	,, ,, ,,
Blood and Bone Fertilizer	M.L.	5·00	..	3·00	12·00	15·00	..	7 0 0	Mt. Lyell M. and R. Co., Melbourne
Bone Fertilizer	,, ...	3·00	..	3·00	13·00	16·00	..	6 2 6	,, ,, ,, ,,
Animal Fertilizer ..	A.N.A. Surprise ..	3·00	..	5·00	11·00	16·00	..	5 15 0	G. W. Pennell, Braybrook
Blood and Bone Fertilizer	Wischer's ..	5·00	..	3·00	12·00	15·00	..	7 0 0	Wischer and Co., Melbourne
Bone Fertilizer	,, ...	3·00	..	3·00	13·00	16·00	..	6 2 6	,, ,, ,,
Phosphoric Acid difficultly Soluble.									
Ground Phosphate ..	Federal G.P. ..	..	..	..	36·65	36·65	..	5 0 0	Australian Explosives and Chemical Co., Melbourne
Malden Islands Guano, 50 %	Sickle	..	..	..	22·90	22·90	..	4 0 0	Cuming, Smith, and Co., Melbourne
Ground Phosphate, 80 %	,, ...	..	..	..	36·65	36·65	..	5 0 0	,, ,, ,, ,,
Indian Ocean Natural Guano	Hasell's ..	0·50	..	6·00	24·00	30·00	..	4 5 0	A. H. Hasell, Melbourne
Ground Rock Phosphate 60%	,, ...	..	..	..	27·50	27·50	..	3 15 0	,, ,,

Ground Phosphate, 50 %	M.L.	..	..	..	23·00	23·00	..	3 10 0	Mt. Lyell M. and R. Co., Melbourne
Ground Phosphate, 80 %	,,	..	..	..	36·65	36·65	..	5 0 0	,, ,, ,,
Guano, 50 %	,,	..	..	..	23·00	23·00	..	4 0 0	,, ,, ,,
Ground Phosphate, 80 %	Wischer's	..	..	..	36·50	36·50	..	5 0 0	Wischer and Co., Melbourne
Malden Island Guano	,,	..	..	..	23·00	23·00	..	4 0 0	,, ,, ,,
Containing Nitrogen, Phosphoric Acid, and Potash.									
Beet Manure	Federal Beet	4·50	11·00	0·75	1·25	13·00	5·50	8 12 6	Australian Explosives and Chemical Co., Melbourne
Grass (Top Dressing)	Federal T.D.	1·60	11·00	0·64	1·30	12·94	1·50	5 5 0	,, ,, ,, ,,
Grass (Laying Down)	Federal G.L.	0·50	11·00	0·64	6·30	17·94	2·00	5 5 0	,, ,, ,, ,,
Horticultural	Federal H.M.	2·50	11·62	0·68	1·38	13·68	10·00	9 0 0	,, ,, ,, ,,
Maize	Federal M.Z.	2·36	10·20	0·60	6·20	17·00	2·00	6 7 6	,, ,, ,, ,,
Onion	Federal M.G.	2·00	11·00	0·64	1·30	12·94	5·00	6 7 6	,, ,, ,, ,,
Orchard	Federal F.M.	1·80	13·22	0·78	1·55	15·55	8·00	7 7 6	,, ,, ,, ,,
Pea, Bean, and Clover	Federal P.B.	0·50	10·00	0·60	4·20	14·80	3·00	5 5 0	,, ,, ,, ,,
Potato	Federal Potato	1·00	14·00	0·80	1·64	16·44	5·00	6 7 6	,, ,, ,, ,,
Rape	Federal Rape	0·98	10·50	0·62	4·03	15·15	2·00	5 10 0	,, ,, ,, ,,
Vine	Federal V.S.P.	7·00	7·15	0·42	0·84	8·41	12·00	12 10 0	,, ,, ,, ,,
A. and P. Mildura, No. 1	Sickle	3·46	9·41	0·55	1·10	11·06	11·60	9 7 6	Cuming, Smith, and Co., Melbourne
Citrus, Mildura, No. 1	,,	1·39	3·79	0·22	7·87	11·88	16·25	8 15 0	,, ,, ,, ,,
Grass	,,	0·30	11·05	0·65	8·85	20·55	3·00	5 5 0	,, ,, ,, ,,
Horticultural	,,	4·00	11·22	0·66	1·32	13·20	8·40	9 0 0	,, ,, ,, ,,
Maize	,,	2·20	14·62	0·86	1·72	17·20	1·80	6 7 6	,, ,, ,, ,,
Onion	,,	2·00	13·60	0·80	1·60	16·00	3·60	6 7 6	,, ,, ,, ,,
Orchard	,,	2·40	12·92	0·76	1·52	15·20	7·20	7 7 6	,, ,, ,, ,,
Potato, "A"	,,	1·30	8·00	3·10	5·88	16·98	5·20	7 0 0	,, ,, ,, ,,
Potato, "B"	,,	1·20	14·62	0·86	1·72	17·20	4·16	6 7 6	,, ,, ,, ,,
Root Crop	,,	1·30	8·00	3·10	5·88	16·98	5·20	7 0 0	,, ,, ,, ,,
Rose	,,	3·94	6·18	0·36	0·72	7·26	13·94	12 0 0	,, ,, ,, ,,
Vine	,,	2·40	12·92	0·76	1·52	15·20	7·20	7 7 6	,, ,, ,, ,,
Vine, "B"	,,	1·25	10·62	0·63	5·00	16·25	7·50	6 15 0	,, ,, ,, ,,
Vine, Mildura, No. 1	,,	5·53	7·14	0·42	0·84	8·40	11·60	10 15 0	,, ,, ,, ,,
Vine, Mildura, No. 3	,,	7·14	7·14	0·42	0·84	8·40	11·60	11 2 6	,, ,, ,, ,,
Dissolved Peruvian Guano	Ohlendorff's	5·73	9·40	2·55	0·81	12·76	1·47	13 5 0	Gibbs, Bright, and Co., Melbourne
Beet	Hasell's	4·00	11·00	0·75	1·25	13·00	8·20	8 17 6	A. H. Hasell, Melbourne
Fodder Crop	,,	3·00	11·50	1·25	1·50	14·25	1·00	6 6 6	,, ,, ,,
Lawn	,,	0·40	11·25	1·00	8·50	20·75	2·50	5 5 0	,, ,, ,,
Grass	,,	0·40	11·25	1·00	8·50	20·75	2·50	5 5 0	,, ,, ,,
Horticultural	,,	3·80	11·00	0·50	2·00	13·50	8·00	8 15 0	,, ,, ,,
Maize	,,	3·00	11·50	1·25	1·50	14·25	1·00	6 6 6	,, ,, ,,
Onion	,,	3·00	9·50	1·00	1·50	12·00	3·06	6 6 6	,, ,, ,,
Orchard	,,	2·00	14·00	0·75	0·25	15·00	7·14	7 7 6	,, ,, ,,
Potato	,,	1·00	12·75	0·75	2·00	15·50	6·00	6 7 6	,, ,, ,,
Root Crop	,,	3·20	7·00	1·00	2·50	10·50	4·50	9 15 0	,, ,, ,,
Tomato	,,	3·80	11·00	0·50	2·00	13·50	8·00	8 15 0	,, ,, ,,
Vine	,,	2·00	14·00	0·75	0·25	15·00	7·14	7 7 6	,, ,, ,,
A. and P., No. 1, Mildura	M.L.	4·46	9·41	0·55	1·10	11·06	11·57	9 12 6	Mt. Lyell M. and R. Co., Melbourne
Barley	,,	0·80	15·00	1·00	1·50	17·50	2·00	5 10 0	,, ,, ,, ,,
Citrus, No. 1, Mildura	,,	1·39	3·61	0·21	7·82	11·64	16·88	8 17 6	,, ,, ,, ,,
Fodder Crop	,,	3·00	11·84	0·70	2·46	15·00	[illegible]	6 7 6	,, ,, ,, ,,

List of Fertilizers Registered at the Office of the Secretary for Agriculture under the Artificial Manures Acts—*continued*.

Description of Manure.	Brand.	Nitrogen	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
Containing Nitrogen, Phosphoric Acid and Potash—continued.		%	%	%	%	%	%	£ s. d.	
Lawn ..	M.L. ..	0·90	12·00	3·50	1·50	17·00	1·00	5 5 0	Mt. Lyell M. and R. Co., Melbourne
Grass (*Top Dressing*) ..	,, ..	0·90	12·00	3·50	1·50	17·00	1·00	5 5 0	,, ,, ,, ,,
Grass (Laying Down) ..	,, ..	0·30	11·05	0·65	9·05	20·75	2·70	5 5 0	,, ,, ,, ,,
Horticultural ..	,, ..	4·00	11·00	0·75	1·45	13·20	8·25	9 0 0	,, ,, ,, ,,
Maize ..	,, ..	3·00	11·84	0·70	2·46	15·00	1·00	6 7 6	,, ,, ,, ,,
Onion ..	,, ..	3·00	10·35	0·61	2·04	13·00	3·00	6 7 6	,, ,, ,, ,,
Orchard ..	,, ..	2·35	13·00	0·75	1·50	15·25	7·20	7 7 6	,, ,, ,, ,,
Potato ..	,, ..	1·20	14·50	1·00	1·70	17·20	4·15	6 7 6	,, ,, ,, ,,
Potato (with Bone) ..	,, ..	1·05	8·50	0·50	7·30	16·30	8·80	7 0 0	,, ,, ,, ,,
Rape ..	,, ..	1·00	15·00	1·00	2·50	18·50	1·00	5 10 0	,, ,, ,, ,,
Root Crop ..	,, ..	3·18	9·59	0·56	2·13	12·28	4·75	6 17 6	,, ,, ,, ,,
Rose ..	,, ..	4·00	6·50	0·50	0·50	7·50	14·00	12 0 0	,, ,, ,, ,,
Tomato ..	,, ..	4·00	11·00	0·75	1·45	13·20	8·25	9 0 0	,, ,, ,, ,,
Vine ..	,, ..	2·35	13·00	0·75	1·50	15·25	7·20	7 7 6	,, ,, ,, ,,
Vine, "B" ..	,, ..	1·25	10·63	0·63	5·24	16·50	7·50	8 15 0	,, ,, ,, ,,
Vine, No. 1, Mildura ..	,, ..	5·53	6·98	0·41	0·82	8·21	12·07	10 15 0	,, ,, ,, ,,
Vine, No. 3, Mildura ..	,, ..	7·14	6·98	0·41	0·82	8·21	12·07	11 5 0	,, ,, ,, ,,
Vine, No. 5, Mildura ..	,, ..	1·00	5·67	0·34	6·00	12·01	17·33	8 15 0	,, ,, ,, ,,
Vine, No. 6, Mildura ..	,, ..	1·12	6·37	0·38	6·75	13·50	13·00	7 17 6	,, ,, ,, ,,
Grass ..	Wischer's ..	0·75	9·77	0·57	5·16	15·50	2·60	5 5 0	Wischer and Co., Melbourne
"Key" Fertilizer ..	,, ..	0·50	15·30	0·90	1·80	18·00	2·60	5 15 0	,, ,, ,,
Hop ..	,, ..	2·00	13·60	0·80	1·60	16·00	5·20	7 2 6	,, ,, ,,
Market Gardener's ..	,, ..	3·38	9·35	0·55	1·10	11·00	6·50	7 7 6	,, ,, ,,
Horticultural ..	,, ..	3·00	11·26	0·66	1·33	13·25	9·75	9 0 0	,, ,, ,,
Nurseryman's Plant Food	,, ..	5·00	8·50	0·50	1·00	10·00	13·00	12 0 0	,, ,, ,,
Maize ..	,, ..	1·75	14·66	0·86	1·75	17·27	2·60	6 7 6	,, ,, ,,
Onion ..	,, ..	2·50	9·35	0·55	1·10	11·00	4·55	6 7 6	,, ,, ,,
Orchard ..	,, ..	3·38	9·35	0·55	1·10	11·00	6·50	7 7 6	,, ,, ,,
Potato ..	,, ..	0·94	12·07	0·76	1·52	15·25	5·85	6 7 6	,, ,, ,,
Potato (with Bone) ..	,, ..	1·05	8·50	0·50	6·60	15·60	7·80	7 0 0	,, ,, ,,
Rape ..	,, ..	1·05	8·50	0·50	6·60	15·60	7·80	7 0 0	,, ,, ,,
Rose ..	,, ..	4·00	6·80	0·40	0·80	8·00	15·60	12 0 0	,, ,, ,,
Vine ..	,, ..	3·00	8·50	0·50	1·00	10·00	7·80	7 7 6	,, ,, ,,

ntaining Nitrogen and Phosphoric Acid.									
and P., Mildura, No. 2	Sickle	4·45	12·11	0·71	1·42	14·24	..	7 12 0	Cuming, Smith, and Co., Melbourne
rus, Mildura, No. 2 ..	,, ...	2·02	5·52	0·32	11·45	17·29	..	5 17 6	,, ,, ,, ,,
ass (Top Dressing) ..	,, ...	0·70	16·40	0·97	1·93	19·30	..	5 5 0	,, ,, ,, ,,
pe	,, ...	1·25	15·30	0·90	2·55	18·75	..	5 10 0	,, ,, ,, ,,
ne, No. 2, Mildura ..	,, ...	7·13	9·18	0·54	1·08	10·80	..	9 7 6	,, ,, ,, ,,
ne, No. 4, Mildura ..	,, ...	9·20	9·18	0·54	1·08	10·80	..	10 0 0	,, ,, ,,
ipe	Hasell's ..	1·20	14·25	1·00	2·25	17·50	..	5 7 6	A. H. Hasell, Melbourne
and P., No. 2, Mildura	M.L.	5·75	12·11	0·71	1·42	14·24	..	8 0 0	Mt. Lyell M. and R. Co., Melbourne
rus, No. 2, Mildura ..	,, ...	2·02	5·54	0·33	11·43	17·30	..	5 17 6	,, ,, ,, ,,
ne, No. 2, Mildura ..	,, ...	7·13	9·18	0·54	1·08	10·80	..	9 7 6	,, ,, ,, ,,
ne, No. 4, Mildura ..	,, ...	9·20	9·18	0·54	1·08	10·80	..	10 0 0	,, ,, ,, ,,
ntaining Phosphoric Acid and Potash.									
ecial Grain	Federal S.G., No. 1	..	16·50	1·00	2·00	19·50	1·50	5 5 0	Australian Explosives and Chemical Co., Melbourne
,, ,, ...	Federal S G. ..	..	16·50	1·00	2·00	19·50	0·75	5 0 0	,, ,, ,, ,,
guminous	Sickle	..	15·30	1·00	1·90	18·20	2·60	5 5 0	Cuming Smith, and Co. Melbourne
,, ...	Hasell's ..	..	12·00	1·00	3·00	16·00	4·59	5 5 0	A. H. Hasell, Melbourne
,, ...	M.L.	..	15·30	1·00	1·90	18·20	2·60	5 5 0	Mt. Lyell M. and R. Co., Melbourne
,, ...	Wischer's ..	..	15·30	0·90	1·80	18·00	2·60	5 5 0	Wischer and Co., Melbourne
a	,, ..	..	14·45	0·85	1·70	17·00	7·80	6 10 0	,, ,, ,,

P. RANKIN SCOTT,
Chemist for Agriculture.

Department of Agriculture,
Melbourne, 2nd December, 1913.

PIG FEEDING.

Results of Pig Feeding Experiments conducted at the Warrnambool Agricultural High School Farm for 18 months to July, 1913.

By F. C. Grace.

Owing to the immense quantities of whole milk now being disposed of by the Western District farmers to Nestlés, Trufood, and Bacchus Marsh Companies, the supply of dairy offal has been greatly reduced, and many dairymen, on this account, and because of the fluctuating character of the markets, have quite given up keeping pigs. Having for so long been in the habit of raising their pigs on little else than skimmed milk, potatoes, &c., they are inclined to believe that there is nothing to be made with pigs by any other method of feeding. If it could clearly be demonstrated that large quantities of skimmed milk were not essential to the profitable production of pork and bacon, many dairymen, now that a steady market and standard price seem to be assured, would gladly take up pig breeding and fattening again.

From feeding experiments conducted in other countries, there is little room for doubt that handsome profits can be made from pigs, if fed on correct lines, even when all food eaten has to be purchased. Realizing that climatic and other conditions might cause a material difference in the results obtained here and in other countries, the experiments in pig feeding and raising, which are being conducted at the Warrnambool Agricultural High School, were undertaken to determine under local conditions the comparative feeding values of various grain rations, the weekly gains made by pigs from birth to maturity, and the cost of producing a pound of live pork at various periods of growth. The following report, dealing with the work of the past eighteen months, may prove useful as an indication of the possibilities of the bacon industry, but as we have only gone a little way into the field of investigation, later results may alter the relative position at present held by the various rations.

Extreme care has been exercised in every part of the work, and the figures given in the tables are accurate.

The various rations are weighed and entered up each morning. Each pig is number-marked at birth, and is weighed every week until sold, so the individual performance, as to increase, of all animals born on the farm is available. (The remarkable difference in gains made by litter mates would astonish most farmers.)

The greatest gain made by any pig for a week was 25¾ lbs. This was made by a pure Berkshire barrow about seven months old, which was fed a pollard and maize ration. The same pig gained 70 lbs. in four weeks (an average of 17½ lbs. per week for four weeks). So far thirty-four tests have been conducted, with an average of five pigs in each test. The rations have been—

Rations	
Pollard and milk (skimmed) Pollard, peas, and milk (skimmed) Pollard, barley meal, and milk (skimmed) Pollard, mangels, and milk (skimmed) Pollard, maize, and milk (skimmed) Pollard, potatoes, and milk (skimmed)	In every case a small quantity of bran was used with the ration, and all pigs to 16 weeks of age had a small quantity of bone meal daily.

Over 6 tons of live pork have been produced, and the average cost per pound for all rations with pigs of all ages has been 1.67d. The actual selling price has been 5.21d. per pound, but a number of the pigs were sold as studs somewhat above market price. Taking the average of all pigs sold in the open yards for bacon purposes, about 4½ tons, the selling price was 4.79d. per pound—a margin of over 3d. per pound over and above the cost of food. The foods composing the rations were charged up at the following rates:—

Pollard	£5 per ton
Bran	£5 per ton
Barley Meal . ..	£6 5s. per ton
Maize	4s. per bushel
Peas	4s. per bushel
Mangels	£1 per ton
Potatoes	£1 per ton
Skimmed Milk	½d. per gallon (4d. per can)

This standard of prices will be adhered to throughout all the experimental work, with the object of securing uniformity in results. The experiments have been divided into three classes—

Class I. deals with pigs from birth to 10 weeks of age.

Class II. deals with pigs from 10 weeks to 16 weeks of age.

Class III. deals with pigs from 16 weeks upwards.

In Class I. the sows are weighed before farrowing, and any loss in weight during suckling is deducted from the weight of the litter at ten weeks old. All the food eaten by both sow and litter is charged up against the litter.

In Class I. 49 pigs made their gain at a cost of 1.26d. per lb.

In Class II. 59 pigs made their gain at a cost of 1.45d. per lb.

In Class III. 62 pigs made their gain at a cost of 1.79d. per lb.

The average weight of all pigs at 10 weeks was 52.7 lbs.; weekly average, 5.27 lbs.

The average weight of all pigs at 16 weeks was 103.832 lbs.; weekly average, from 10 to 16 weeks, 8.522 lbs.

The average weight of all pigs at 24 weeks was 190.152 lbs.; weekly average, from 16 to 24 weeks, 10.79 lbs.

The tables given below set out in detail the amounts and kinds of food, the total cost, the cost per lb. increase, the total gain made by the pens of pigs, the average weekly gains of pigs, and the number of pigs in each test for each of Classes I., II., and III.

Looking at the table for Class I., it will be noticed that Nos. 5 and 6, the eighteen pigs which were fed pollard and milk and had the run of rape pasture, made their gain at the remarkably low figure of .883d. per lb., being much the cheapest ration.

If we follow these pigs (No. 5) on to the other classes, we find six of them, as No. 6 in Class II., fed pollard and milk, but still running on rape pasture, making their gains for .9d. per lb.; and in Class III., as No. 7, penned up, but still fed pollard and milk, making their gains at .92d. per lb.; while their litter mates, as No. 10, in Class II., that were penned and fed pollard and peas and milk, gained less at a cost of 1.65d. per lb; and as No. 10, in Class III., fed the same ration, pollard, peas, and milk, making their gain at 1.68d. per lb., and 2.2 lbs. per pig weekly less than their mates.

These results indicate the high feeding value of rape for pigs when fed in combination with a good grain ration. The results of the trials with eighteen pigs shows a saving of 763 lbs. of grain and 741 lbs. of milk in the production of 949 lbs. of pork; equal to a little over ½d. per lb. In Class I. the grain was mixed with skimmed milk and water in the proportion of one part grain to 3½ of liquid by weight. The ration for each twenty-four hours was mixed up after feeding in the morning for all classes; and Class II. was mixed in the proportion of 1 lb. of grain to 3 of liquid; and Class III. was mixed in the proportion of 1 lb. of grain to 2¼ of liquid. No feed was cooked, except mangels and potatoes, but neither of these are relished by well-fed pigs, and only small quantities were eaten. In Class II., 10 to 16 weeks, pollard and milk proved the cheapest ration, pollard and peas and milk next, and then pollard, barley meal, and milk. The last ration was only tried once, a pen of four pigs, so results cannot be taken into account.

In Class III., 16 weeks and upwards, contrary to expectations, pollard and milk again proved cheaper than pollard, barley meal, and milk, though the gains made on it were not quite so heavy as on the barley meal, .793 lbs. per pig weekly less.

Pollard and peas and milk gave better results than pollard and milk, increasing the weight more rapidly, .24 lbs. more per pig weekly, and using 11 lbs. of grain and 216 lbs. of milk less per 100 lbs. of gain. However, sufficient pigs have not yet been tested on this ration to make a proper comparison with the other rations.

A general review of the thirty-four tests carried out would indicate the following points:—(1) The younger the pig the cheaper the gain per lb. can be made. (2) That pollard and milk, with a little bran, is one of, if not the, cheapest rations to feed to pigs of all ages. (3) That rape pasture is likely to materially reduce the cost of production. (4) That with well-bred pigs, properly fed and cared for, first-grade pork and bacon can be produced under local conditions for about 1¾d. per lb. live weight, or under 2¼d. per lb. dressed weight. (5) That an average weekly gain of about 8 lbs. should be expected, and the pig put on the market at from 180 to 200 lbs. live weight inside six months.

It might be well to draw a comparison between the cost of producing pigs on the farm as shown above, and the present market value of store pigs.

Recently three pens of pigs were purchased in the local yards at good value, according to the market. One pen was bought at £1 19s. per head; one at £1 10s.; and a pen of suckers, just off the sow, at 15s. When weighed these pigs showed the price per lb. of the three pens respectively to be as follows:—3.95d. per lb., 4.5d. per lb., and 7d. per lb. live weight. These prices should show a return of 2¼d., 2¾d., and 5¾d. per lb. to the grower above cost of feed.

Though three or four pens of well-grown store pigs may be turned over in the same time as it will take to bring pigs from birth to maturity, the immense disparity in the cost of rearing and purchasing as stores is worth serious consideration by the dairyman who is taking up the industry. From the experiments detailed above, it has been clearly demonstrated that pig-raising and fattening, with only a very limited

supply of skimmed milk, is an excellent proposition. With the co-operative bacon companies now starting, there is every prospect of a big export trade being opened up, and a steady price for the raw article the whole year through, so that no fears need be entertained as to over-production, and failure on that account.

CLASS 1.

PIGS FROM BIRTH TO TEN WEEKS OF AGE.

—	Food.			Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	Pollard.	Bran.	Skimmed Milk.						
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		Weeks.
1	643	68	2,060	2 2 5	5·71	1·48	342·6	6	0–10
2	709	191·25	2,730	2 17 10	6·04	1·43	483·84	8	0–10
	1,352	259·25	4,790	5 0 3	5·88	1·45	826·44	14	0–10

Ration.—Pollard, bran, skimmed milk ; in proportion, 5·6 pollard, 18·4 milk, 1 bran.

—	Food				Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs	Ages of Pigs.
	Pollard.	Bran.	Mangels.	Milk.						
	lbs.	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
3	639	203	280	700	2 6 9	5·81	1·378	407·0	7	0–10
4	805	200	295	700	2 15 0	4·0	1·55	400·0	10	0–10
	1,444	403	575	1,400	5 1 9	4·74	1·513	807·0	17	0–10

Ration.—Pollard, bran, mangels, skimmed milk; in proportion, pollard 3·54, mangels 1·42, milk 3·47, bran 1.

—	Food.			Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs	Ages of Pigs.
	Pollard.	Bran.	Milk.						
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
5	456·5	161·75	2,490	1 19 3	4·495	·952	494·43	11	0–10
6	352·5	118·0	2,150	1 10 8	6·5	·809	455·0	7	0–10
	809·0	279·75	4,640	3 9 11	5·27	·883	949·43	18	0–10

Ration.—Pollard, bran, skimmed milk, with rape pasture. Proportion of grain and milk. Pollard 2·88, milk 16·5, bran 1.

CLASS I.—PIGS TO 10 WEEKS OF AGE.

Total gain, 2,582 lbs., at cost of 1·26d. per lb.
Average weekly gain per pig, 5·27 lbs.

CLASS II.

PIGS FROM TEN WEEKS TO SIXTEEN WEEKS OF AGE.

—	Food. Pollard.	Bran.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Age of Pigs.
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
1	271·5	89·25	1,400	1 2 6	5·65	1·77	203·5	6	10–16
2	259·0	78·25	1,440	1 1 8	6·81	1·27	204·0	5	10–16
3	211·0	76·5	940	0 17 6	9·7	1·43	146·0	3	10–16
4	502·0	150·75	1,904	1 18 9	8·89	1·64	284·72	4	10–18
5	471·0	135·0	1,357	1 15 7	10·1	1·51	283·0	4	8–15
6	260·0	13·0	1,030	0 17 3	9·6	·9	230·4	6	10–14
7	378·0	..	825	1 1 8	7·91	1·09	237·5	5	10–16
8	707·0*	..	1,580	2 0 8	7·95	1·23	397·5	5	10–20
9	655·0	..	1,440	1 17 7	10·625	1·41	318·75	3	10–20
	3714·5	542·75	11,916	12 13 2	8·33	1·404	2305·97	41	10–16

Ration.—Pollard, bran, skimmed milk; in proportion, pollard 6·8, milk 22, bran 1 lb.

—	Food. Pollard.	Peas.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
10	380	134	795	2 5 7	9·216	1·65	331·8	5	10–16
11	707	220	1,490	2 14 9	8·58	1·53	429·0	5	10–20
12	756	156	1,475	2 13 2	8·343	1·91	333·72	4	10–20
	1,843	510	3,760	7 13 6	8·74	1·68	1094·52	14	10–19

Ration.—Pollard, peas, skimmed milk; in proportion, pollard 3·61, milk 7·3, peas 1 lb.

—	Food. Pollard.	Bran.	Barley Meal.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
13	219	120	200	1,095	1 13 1	9·645	1·71	231·5	4	10–16

Ration.—Pollard, barley meal, bran, skimmed milk; fed in the proportion of pollard 22 lbs., barley meal 20 lbs., bran 12 lbs., milk 110 lbs.

CLASS II.—PIGS 10 TO 16 WEEKS OF AGE.

Total gain, 3,632 lbs., at 1·45d. per lb.
Average weekly gain per pig, 8·522 lbs.

CLASS III.

PIGS FROM SIXTEEN WEEKS UPWARDS.

—	Food. Pollard.	Barley Meal.	Bran.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
1	438·25	1,191	..	1,870	5 3 0	12·16	2·12	583·74	6	16–24
2	226·5	71	..	500	0 17 5	13·76	1·68	123·9	3	15–18
3	516·0	170	86·5	986	2 3 9	13·11	2·0	262·28	4	18–23
4	63·0	159	57	540	0 17 9½	8·625	2·06	103·5	4	15–18
5	646·5	922	272	2,285	5 3 7½	9·63	1·98	626·5	5	13–26
	1890·25	2,473	415·5	5,181	14 5 7	11·333	2·01	1699·92	22	16–24

Fed in proportion.—Pollard 4·55, barley meal 5·9, milk 12·4, bran 1 lb.

—	Food. Pollard.	Bran.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
6	1157·25	206·75	1,800	3 14 2	11·53	1·93	461·35	5	16–24
7	317·0	20·0	1,135	1 0 6½	11·1	·92	266 5	6	14–20
8	554·0	..	1,271	1 12 0	9·47	1·35	284·25	5	16–22
9	632·0	272	2,255	5 2 8	9·96	1·90	647·5	5	13–26
	3660·25	498·75	6,461	11 19 4½	10·54	1·73	1659·6	21	16–24

Fed in proportion.—Pollard 7·2, milk 13, bran 1 lb.

—	Food. Pollard.	Peas.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
10	552	92·5	1,220	1 17 10	8·98	1·68	269·65	5	16–22
11	366	52	990	1 5 6	12·9	1·71	178·0	2	16–23
12	683	329·5	210	2 16 9	10·47	1·62	419·0	4	17–27
	1,601	474	1,420	6 0 1	10·19	1·66	866·65	11	16–24

Fed in proportion.—Pollard 3·37, peas 1 lb., milk 3 lbs.

[Class III. continued next page.

CLASS III.—*continued.*

—	Food. Pollard.	Bran.	Mangels.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
13	273	72	272	122	1 0 2	7·5	1·61	150	2	14–24
14	374	..	273	965	1 4 2	12·0	1·73	168	2	16–23
	647	72	545	1,087	2 4 4	9·75	1·67	318	4	16–24

Fed in proportion.—Pollard 9, mangels 7·75, milk 15·5, bran 1 lb.

—	Food. Pollard.	Maize.	Skimmed Milk.	Total Cost.	Average Weekly Gain.	Average Cost per lb.	Total Increase of Pen.	Number of Pigs.	Ages of Pigs.
	lbs.	lbs.	lbs.	£ s. d.	lbs.	d.	lbs.		weeks.
15	399	168	990	1 15 3	11·45	1·84	229	4	20–25

Fed in proportion.—Pollard 2·37 lbs., milk 5·8 lbs., maize 1 lb.

CLASS III.—PIGS 16 WEEKS UPWARDS.

Total gain, 4,773 lbs., at 1·79d. per lb.
Average weekly gain per pig, 10·79 lbs.

[This article is published at the request of the Council of the Agricultural High School, Warrnambool.—EDITOR].

Extract from "*Le Progres Agricole et Viticole,*" 29.6.1913.

Methode pour Obtenir de Forts Rendements en Cereales (Method for obtaining high yields from cereals): *by N. and B. Demtchinski*—Description of ridge culture methods (Culture en billons), Vol. in=8, 184 pp., 72 illustrations. Price 3 fr. 50. Publishers: Chapelot, 30 *Rue Dauphine, Paris; and Lucien Laveur 13 Rue des Saints-Peres, Paris.*

The cultural methods recommended by N. and B. Demtchinski, and which have already given very interesting results in Germany, in Switzerland, in Russia and even in France, are based on the one part on rational utilization of soil moisture, and on the other, on the most normal means of causing this moisture to be absorbed by the roots. These two principles have led the authors to recommend:—1st, Culture in ridges, 2nd, Transplantation of Cereals.

This method, though new in Europe, is far from being so in China, whence M. Demtchinski has brought it back. It has been practised for 3,000 years in China; and, thanks to it alone, that country is able to produce sufficient cereals to feed its immense population.

PHYLLOXERA.

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Viticulture, one of the most ancient, and, under reasonable cultural conditions, one of the most profitable branches of agriculture, is admirably adapted to a very extensive portion of our own and the sister States. Besides its remunerative character, another important recommendation for this pursuit is that there are certain considerable areas of land, though not well fitted for other branches of agriculture, yet lend themselves readily to profitable viticulture.

By the introduction of phylloxera into Victoria nearly forty years ago, this important industry received a temporary set-back, from which it is now steadily recovering, thanks to reconstitution with American resistant vines.

In response to repeated requests for an account of this terrible scourge, the present article is submitted to readers of the *Journal.* Portions of it were read by invitation before the Australian Association for the Advancement of Science, and other parts have appeared in departmental papers during a long period of personal investigations on this subject.

As is probably well known, the insect is indigenous to North America, and was first scientifically described in 1854 by a talented entomologist (Mr. Asa Fitch), who had been deputed by the State authorities of New York to study insects in their relation to agriculture. During the course of his interesting investigations he noticed galls on the leaves of native vines. Examination disclosed the tiny but formidable insect (*Phylloxera vastatrix*) whose ravages are now only too well known in all the viticultural countries of the world. It is allied to the well-known aphids or "plant-lice," none of which are indigenous to Australia. The losses caused by these little creatures are beyond computation.

In 1863 the pest had invaded the vineries of England, where it wrought great havoc. About this time disquieting rumours of a very serious and deeply mysterious disease among vines in certain localities in France caused great uneasiness and anxiety among vignerons. In 1864, according to Laffiere, phylloxera was definitely recognised there. Rooted vines had been imported from the United States, and the insects, or their eggs, had been unconsciously introduced with these importations during the years 1858 to 1862. The importers of these plants were naturally unaware of the presence of the mischievous insect, and equally ignorant of the awful devastation it would cause in the vineyards. Those were the days when rural producers had not realized the risks of importing plants and seeds without the skilled supervision now found essential, and provided for by legislation in almost every country.

Two infected spots were noticed at first in France, one near Garde, the other near Bordeaux. Like circles on the water, these centres of infection gradually widened, taking year by year increased areas, till, about 1880, the formidable invader had spread over the greater part of the south of France, and commenced its irresistible advance towards the north. Four years later it was computed that two and a-half

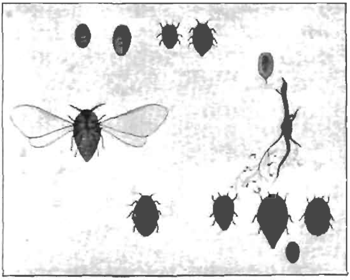
million acres of vines had been destroyed. So rapid and thorough was the destruction that vine stumps became the chief supply of fuel in what had been formerly flourishing vine-growing districts. All methods were tried to exterminate the insect, but all were equally unavailing. In about a dozen years from its introduction, phylloxera had spread over the chief wine-producing countries of Europe. To-day there is hardly a viticultural country on the surface of the globe that has escaped infection.

In 1875 it was unintentionally introduced into Victoria. In that year a well-known nurseryman imported a number of the newest and choicest varieties of vines from an English firm. The superintendent who had charge of this firm's vinery at that time visited our State a few years later on a holiday. In relating his vine-growing experiences to an intimate friend of the writer, the visitor unconsciously gave the solution of the mystery of the introduction of phylloxera. He stated that a few years previously the vines under his care "went off" in an inexplicable manner. Older vines became sickly. Young vines died in the pots. Propagation became difficult, and finally impossible. Inquiries were carefully and diligently made. Searching investigation followed, and eventually the dreaded phylloxera was discovered to have been the cause of the disaster. Just before these alarming symptoms showed themselves, and from this very vinery—then regarded as absolutely free from all traces of disease—novelties were imported, as already indicated, by a Victorian nurseryman. These plants were increased as rapidly as Nature and the nurseryman's skill combined could multiply them. Plants and scions were distributed among a limited number of applicants. In every case where these were secured and planted, the insect was subsequently found at the earliest official inspection. There is no reasonable doubt but that in this way the now almost ubiquitous insect was originally distributed in this State.

Among those who first secured some of these supposed viticultural desiderata was Mr. H. King, of the Fairview Nursery, Fyansford, near Geelong. On the 7th November, 1877, this gentleman's attention was attracted to a couple of his vines that were not thriving like the rest. A careful examination of the roots revealed the cause in the dreaded phylloxera, then seen living for the first time in Victoria. A thorough inspection failed to discover the pest at that time to any extent in the vineyard. So rapidly, however, did it spread that, when the vines were uprooted some six months later, it could be found all over. It is the invariable record of the advent of this pest to every new district. This first-infected vineyard was in every respect a model. The vines were in full vigorous growth. Neither attention nor skilled treatment was wanting. The produce had just secured for the proprietor the National Prize for 100 bunches of wine grapes, 50 white and 50 black. The same vines, too, had, at the previous vintage, yielded 1,100 gallons of excellent wine to the acre; thus amply refuting the statements hazarded at the time, and often repeated since, that the disease would only be found in neglected, worn-out, or uncultivated vineyards.

The following year (1878) found the infection widely spread throughout the Geelong district, as official reports and records of

eradication show. Under legislative authority, heroic measures were adopted in the hope of completely annihilating the pest. All vines within the quarantined area, which was very extensive, were ordered to be destroyed. Some of the writer's early recollections are of owners looking on, alternately frantic and morose with rage, while gangs of men employed by the Government were busily engaged in uprooting the vineyards. Naturally, some did not take the despoiling of their property quietly. More than once the workmen hurriedly sought the boundary fence, closely followed by the business end of a pitchfork, or other weapon, in the hands of an enraged owner of foreign nationality. Nor was the watch-dog wanting in valour on such exciting occasions. All vineyards—clean and infected alike—were destroyed. Practically every vine was uprooted in the vain hope of wiping out, at once and for ever, the tiny but deadly foe of the vigneron. Those who stated, as many did at this time, that Victoria was now free from the pest, reckoned without their host.



Life history.

Subsequently, the insidious enemy invaded the Bendigo, Goulburn Valley, and Rutherglen districts. In the former locality, as at Geelong, the vineyards were sacrificed. The vines were uprooted and burned as a holocaust to the insatiable phylloxera, but without the desired effect.

The life history of this insect is remarkable and somewhat complicated. Owing to the great difficulties of observing so minute an insect of, chiefly, subterranean habits, the cycle was not so quickly discovered as would be the case with insects more readily observed. It may be here mentioned that another species lives on the Oak, but this insect has not distinguished itself as the one we are discussing has done.

The eggs, which tide the insects over the cold of winter, are for this reason known as "winter-eggs." They are laid on the wood of the vine, particularly on the older wood. Probably they may have originally been also deposited on the younger canes, but as these are removed annually at pruning time and destroyed, the instinct to seek the more

secure positions on the vine became hereditary. Cold of climates much more rigorous than our own does not impair the vitality of these eggs. They may be frozen without injury. The warmth of spring or early summer hatches them out. If the vine be of American origin, the newly-hatched insects may form galls on the leaves. If on a vine known as European, then they descend to the roots, where several generations—the parthenogenetic progeny of "laying mothers"—carry on their work of silent destruction. About the middle, or towards the end of summer, some of these subterranean forms begin to show signs of wing development. They are then known as "nymphs." This change is specially marked when they have exhausted their food supply by destroying the feeding roots of the vine. In original experiments conducted by the writer in 1904, it was proved that wing development could be hastened or retarded by cutting off, or allowing the food supply to remain. After several moults the wings become sufficiently developed. Their eyes, too, have been adjusted for life above ground. By this time the insects have arrived at the surface. Thence they fly, and are carried in the direction of the prevailing winds to set up new colonies of infection in the same or an adjoining vineyard.

"Laying Mother," showing eggs.

Nymph.

Having reached a suitable spot, these winged migrants lay eggs on the vine selected for the purpose. These eggs differ distinctly in size. From the larger, females are produced, while the smaller give rise to the male. This is the first appearance in the cycle of the sexes. These insects have their organs of nutrition undeveloped. They pair, and the result of the union is the fertilization of the winter-egg already described. The tiny male insect immediately dies. His partner only survives him till the important function of egg-laying has been accomplished. We thus see that in the life cycle of phylloxera we have what may be termed an "alternation of generations," and that the true sexual individuals are only developed in the last brood for the year. This is characteristic of the aphids. Beside those that thus migrate to other vines, a number of the root—or subterranean—form hibernate on the vine root awaiting warmer weather to begin their deadly work.

The effect of the puncture made by the insect's proboscis in the fine rootlets is to cause it to swell up and curve over in a peculiar manner. Frequently this injured rootlet assumes the shape of a bird's head, neck, and beak. Not only is plant food removed by these little robbers, but the puncture sets up a remarkable irritation, that causes a kind of

mortification of the tissues. A strange discoloration is characteristic of the larger roots attacked. To a skilled observer, an abnormal crop is often the first indication of the attack of the vine. As if the plant were conscious that it cannot long survive, it sets to work to make provision for the production of its seed, which is the natural way to secure the perpetuation of the species. New roots are rapidly thrown out, and the vine seems even more vigorous than ever. But it is only for a time. The unequal struggle cannot long be maintained. After vintage, the leaves change colour and fall early. Next season, growth is stunted, and ere long the vine dies, and the pest spreads further afield.

When it was definitely decided that phylloxera had been introduced to Europe on some of the native American vines, some of the keener viticultural scientists in France concluded there must be some vines in the native home of the insect that could withstand its attack. They argued that unless it changed its food, the parasite would sooner or later destroy all the host plants, and so commit "race suicide." They set themselves the important task of investigating this problem, and, if possible, discovering a remedy. Subsidised by the French Government, a commission of the very best available men was sent out to study the question in the habitat of the insect. The result was the discovery of resistant varieties of American vines, some of which, with their selected hybrids, are now being utilized in the struggle against phylloxera.

No vines are actually *proof* against phylloxera, but some can *resist* its attacks. The roots of such as possess a high resistance are hardier and protected with stouter coverings, through which the proboscides of these dreadful little parasites cannot readily penetrate. Thus, their food supply is restricted, and a consequent limit is placed on their multiplication, such as does not take place on the roots of the ordinary European vine. In the truly resistant vine, too, the injured bark is excoriated, no mortification of the tissues takes place, and consequently the root itself sustains no perceptible damage. The task of the parasite, under such circumstances, resembles that of the mythical Sisyphus, who was condemned to roll up-hill an ever-returning boulder.

The insect and its host plant, the American vine, have been brought up together during centuries. Plants deficient in the natural protection speedily succumbed. The more robust and better protected were the best equipped to carry on the struggle. They survived. The different species were perpetuated by seed. Those seedlings that possessed sufficient resistance were allowed to remain. Those deficient in their resistant qualities were speedily weeded out by an inexorable law of Nature, aided by the voracious phylloxera. The test was a remarkably severe one. In this way a high standard of resistance was secured, and the immunity thus obtained has been utilized by the vigneron, who has found it to be the salvation of the viticultural industry.

The accompanying micro-photographs were taken from actual insects by Mr. Garnet I. Adcock. The illustration of the life-cycle is from a painting of original micro-slides. This was done in natural colours by Mr. T. A. Brittlebank, who so happily combines the training of the naturalist with the skill of the artist.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked over towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and that the weather will not have too drying an effect on the bud. The operation of budding is a very simple one, and easily performed. To gain a successful end, the sap should be flowing freely, consequently, when the cuts are made, the bark should "lift," or "run," easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The buds selected should be firm and well matured, and should show no signs of premature decay whatever. They are cut from the scions with a shallow cut, and if any wood in the cutting be left in, this should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pushed down into position, and then be bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level with the horizontal cut. With practice, it will soon become possible to cut buds that will need neither cutting nor trimming.

After two or three weeks, the buds may be examined to see if they have "taken": that is, if the bud has united thoroughly to the stock. When that occurs, the ties may be cut. If a growth be desired at once, all wood above the bud may be cut off, as soon as the bud has taken. The wood may be cut off some short distance above the bud, to prevent any bark splitting and consequent loss of the bud, and to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till next spring. In this case the lateral or branch is not cut off, but left on until the usual winter pruning.

CULTIVATION.

The necessity for constant surface cultivation is apparent every summer, but more so in dry seasons. Not only in non-irrigable districts is this a necessity, but also in those districts where the trees can be watered, and more so in the latter case. In irrigated orchards the tendency of the soil, as a result of artificial waterings, is to set and harden. Consequently, stirring the surface must be resorted to, in order to keep up a good mechanical condition of the soil, and also to prevent loss of irrigation water by evaporation.

In non-irrigable orchards, the cultivation is necessary to conserve what water has entered the subsoil, as a result of the winter and spring rains. The soil crust should not be allowed to form. Summer

showers are not alone the cause of these formations; dry weather conditions cause the soil to consolidate, and any trampling and vehicular traffic tend to harden the surface, and thus to allow the escape of moisture the trees most need.

SPRAYING.

Spraying for Codlin Moth will require to be very thorough. A spraying should be given during the second week in January, and another in a month's time. All infected fruit should be picked from the trees, or gathered from the ground, and destroyed by boiling. It is often a common practice to place the infected fruit in heaps, and attempt to destroy the larvæ by building a fire on top of the fruit. This method cannot be too strongly condemned, as it is almost inevitable that a number of larvæ will escape. The only way to properly deal with such fruit by burning is to have it burned in a furnace; failing this, boiling is the surest method of extermination when the larvæ are in the fruit. The caterpillars and chrysalids should be searched out of their hiding-places under the bark, in the crevices of the tree, &c. All bandages should be well cleaned, and no chance whatever given to the insects to develop into the second brood.

Owing to the cool weather experienced during the season, woolly aphis is becoming abundant, particularly in sheltered situations. It is advisable to free the trees as much as possible of this pest now, as, if left until the winter, it will destroy a large number of buds on the trees. A strong tobacco solution, any lime spray, resin wash, or kerosene emulsion, will easily kill the insect.

FUMIGATION.

Citrus and other evergreen trees, that are attacked by scale insects, should be freed from the scale at this time. Although spraying with such mixtures as resin compound, crude petroleum emulsion, sulphur lime and salt emulsion will do good work in keeping the scale insects in check, the only effective means of complete eradication is by fumigation. The trees are enclosed in a tent, that will prevent the escape of any gas through its texture. This gas is generated inside the tent, and the tent is kept over the tree for a period of from a half to three-quarters of an hour. The best remedy is hydrocyanic acid gas, which is generated by placing cyanide of potassium in a mixture of sulphuric acid and water. Both the cyanide and the gas are deadly poison, and every care should be exercised in using them.

Vegetable Garden.

Keep the surface continually loose, hoe out all weeds, mulch when necessary, and give abundant supplies of water to growing plants.

Manure and dig over all vacant plots for succession crops; plant out seedlings of cabbage, celery, cauliflower, lettuce, &c., and plant seeds of cabbage, cauliflower, turnip, and leek.

In watering at this time of the year, a better result will be obtained if an occasional overhead spraying is given.

A planting of potatoes may be made for an autumn crop. Tomato plants should be well watered and manured, and all strong growing laterals should be pinched out.

Flower Garden.

As in the orchard, the principal cultural operation is the work of keeping the surface in the condition of a constant earth mulch by hoeing. The surface should be frequently hoed, and it will be found that the more cultivation given, the less water the plants will require. Mulchings in the shape of manure, straw, grass, clippings from lawns, &c., may be used on the flower beds. Mulching should not be used indiscriminately, the requirements of the plants being considered before the mulch is applied. If the plant is entering upon a period of rest, such mulchings as grass or straw may be used. Manure should not be used as a mulch unless it is intended that the latter should be a stimulant, as well as a protection for the roots.

All tall-growing plants such as chrysanthemums, delphiniums, and dahlias should be staked, to protect them from the wind. They should be well mulched and fed, and their growth should be continued throughout. A sharp look-out should be kept for attacks on these plants of red spider; if this insect appears, a good spraying with tobacco solution or benzoline emulsion should be given to the plants. Caterpillars of all descriptions should be kept in check with Paris Green.

Gladioli may now be planted out for autumn blooms. Iceland poppy and pansy seeds, also seeds of perennial and biennial plants, may be sown.

STATISTICS.

The Government Statist (Mr. A. M. Laughton) has just completed tabulations for Victoria of land and live stock in different sized holdings as at March last. The previous tabulations on similar lines related to March, 1910.

A comparison of the position at these dates shows that land privately owned increased from 26,400,818 acres to 28,429,357 acres, there being with one small exception a substantial increase in the number at each size of holdings up to 2,000 acres; a smaller increase in that of holdings between 2,000 acres and 10,000 acres; but a decrease in each size of holdings of over 10,000 acres. There were in 1913 in the last-mentioned division 151 estates containing 2,652,966 acres, as against 175 estates of 3,298,227 acres in 1910; but in the other two divisions there was an increase of 6,595 holdings, or 2,673,800 acres, in the three years.

The tabulation relating to live stock shows that in the same three years there was an increase in the number of horses and pigs but, owing to adverse weather in the autumn of 1912, a decrease in that of cattle

and sheep. The distribution over different sized holdings corresponds with the altered areas, as an increasing proportion of the live stock in the State is shown to be on the smaller sized holdings. The same position prevails in regard to sheep in different sized flocks, as it appears that in March last 40 per cent. of the sheep in Victoria were in flocks of up to 1,000, 32 per cent. in flocks between 1,000 and 5,000, and 28 per cent. in flocks of over 5,000; as against corresponding percentages of 38, 31, and 31 respectively in March, 1910.

CLASSIFICATION OF HOLDINGS OF PRIVATE LAND, as at March, 1910, and March, 1913, compiled from Agricultural and Pastoral statistics.

—	1910.		1913.		Increase of Holdings between 1910 and 1913.	
	Number of Holdings.	Extent of Private Land occupied.	Number of Holdings.	Extent of Private Land occupied.		
Acres.		Acres.		Acres.	Number.	Per cent.
1 to 5 ..	3,469	10,334	4,158	12,627	689	19·86
6 ,, 15 ..	4,420	44,810	5,052	51,293	632	14·30
16 ,, 30 ..	4,854	107,998	5,259	117,141	405	8·34
31 ,, 50 ..	3,866	159,155	4,288	175,898	422	10·92
51 ,, 100 ..	6,696	514,529	7,356	558,534	660	9·86
101 ,, 200 ..	9,208	1,389,057	9,891	1,477,244	683	7·42
201 ,, 300 ..	5,422	1,362,833	5,698	1,428,071	276	5·09
301 ,, 320 ..	2,953	934,608	2,894	914,365	− 59	− 2·00
321 ,, 400 ..	2,951	1,064,036	3,179	1,149,040	228	7·73
401 ,, 500 ..	2,863	1,298,733	3,073	1,390,510	210	7·33
501 ,, 600 ..	2,212	1,221,823	2,451	1,352,613	239	10·80
601 ,, 640 ..	1,650	1,039,247	2,509	1,583,779	859	52·06
641 ,, 700 ..	918	617,603	1,267	851,486	349	38·02
701 ,, 800 ..	1,249	944,343	1,608	1,210,856	359	28·74
801 ,, 900 ..	1,014	867,671	1,135	966,221	121	11·93
901 ,, 1,000 ..	1,173	1,123,644	1,211	1,158,447	38	3·24
1,001 ,, 1,500 ..	2,583	3,175,340	2,784	3,417,332	201	7·78
1,501 ,, 2,000 ..	1,062	1,849,446	1,208	2,091,974	146	13·75
2,001 ,, 2,500 ..	514	1,153,958	552	1,230,679	38	7·39
2,501 ,, 3,000 ..	270	750,766	305	840,565	35	12·96
3,001 ,, 4,000 ..	329	1,145,013	348	1,208,523	19	5·78
4,001 ,, 5,000 ..	150	675,665	167	754,331	17	11·33
5,001 ,, 7,500 ..	161	969,101	185	1,125,383	24	14·91
7,501 ,, 10,000 ..	78	682,878	82	700,479	4	5·13
10,001 ,, 15,000 ..	79	977,245	78	963,016	− 1	− 1·27
15,001 ,, 20,000 ..	52	904,037	38	646,029	− 14	− 26·92
20,001 ,, 30,000 ..	22	564,259	20	494,237	− 2	− 9·09
30,001 ,, 40,000 ..	15	510,762	11	362,726	− 4	− 26·67
40,001 ,, 50,000 ..	5	225,438	3	135,558	− 2	− 40·00
50,001 and upwards ..	2	116,486	1	51,400	− 1	− 50·00
Total private land	60,240	26,400,818	66,811	28,429,357	6,571	10·91
Crown land held in conjunction with privately-owned land ..	..	10,709,200	..	7,710,753	..	..
Holdings of Crown land only	1,571	975,556	1,892	1,078,688	321	20·43
Grand Total ..	61,811	38,085,574	68,703	37,218,798	6,892	11·15

The total area cultivated in 1910 was 4,834,285 acres, and in 1913, 5,706,579 acres.
Minus sign (−) indicates decrease.

LIVE STOCK, classified according to sizes of holdings of privately-owned land—including stock on Crown land, held in conjunction therewith—as at March, 1913.

(Compiled from Agricultural and Pastoral Statistics.)

Size of Holdings of Private Land.	Number in March, 1913.					
	Holdings.	Horses.	Cattle.		Sheep.	Pigs.
			Dairy Cows.	Other Cattle.		
Acres.						
1 to 5 ..	4,158	4,633	5,480	4,039	2,808	1,684
6 „ 15 ..	5,052	7,343	10,182	6,813	4,424	4,250
16 „ 30 ..	5,259	10,500	14,825	10,766	12,697	6,643
31 „ 50 ..	4,288	10,831	19,056	13,923	17,652	8,662
51 „ 100 ..	7,356	25,605	55,362	38,211	68,230	23,323
101 „ 200 ..	9,891	48,133	119,585	87,462	228,752	48,969
201 „ 300 ..	5,698	38,494	83,342	70,488	302,428	31,535
301 „ 320 ..	2,894	22,265	35,668	35,541	197,667	12,345
321 „ 400 ..	3,179	27,441	47,801	48,253	303,947	17,085
401 „ 500 ..	3,073	30,435	42,224	49,042	395,625	14,109
501 „ 600 ..	2,451	25,791	32,928	41,697	392,867	9,716
601 „ 640 ..	2,509	22,835	16,648	26,125	292,312	5,480
641 „ 700 ..	1,267	12,719	13,015	20,996	237,750	4,289
701 „ 800 ..	1,608	19,358	16,147	27,360	387,856	5,118
801 „ 900 ..	1,135	15,935	13,715	25,960	358,213	5,228
901 „ 1,000 ..	1,211	18,099	14,164	26,848	436,856	4,198
1,001 „ 1,500 ..	2,784	47,940	33,438	77,594	1,427,735	10,206
1,501 „ 2,000 ..	1,208	24,208	12,998	38,953	977,380	3,751
2,001 „ 2,500 ..	552	12,519	7,693	25,304	649,203	2,261
2,501 „ 3,000 ..	305	6,983	4,332	15,699	515,414	1,351
3,001 „ 4,000 ..	348	9,616	5,411	19,939	726,481	1,355
4,001 „ 5,000 ..	167	4,750	2,872	13,590	473,833	507
5,001 „ 7,500 ..	185	6,776	3,952	29,987	831,290	1,495
7,501 „ 10,000 ..	82	3,933	1,583	13,167	504,726	258
10,001 „ 15,000 ..	78	3,611	1,512	17,905	761,201	457
15,001 „ 20,000 ..	38	1,918	777	8,344	504,279	104
20,001 „ 30,000 ..	20	1,398	544	4,748	334,753	104
30,001 „ 40,000 ..	11	1,069	180	5,794	269,172	35
40,001 „ 50,000 ..	3	278	74	820	116,723	61
50,001 and upwards	1	220	12	250	41,650	3
Total	66,811	465,636	615,520	805,618	11,773,924	224,582
On holdings of Crown land only (not classified)	1,892	5,277	7,418	13,464	84,737	3,901
In cities, towns, &c., and travelling ..	..	59,581	33,001	33,068	33,563	11,589
Grand Total ..	68,703	530,494	655,939	852,150	11,892,224	240,072

Size of Holdings of Private Land.	Holdings.	Horses.	Cattle.		Sheep.	Pigs.
			Dairy Cows.	Other Cattle.		
	Increase.	Increase.	Increase	Decrease.	Decrease.	Increase.
Acres.						
1 to 5	689	1,064	786	+ 86	2,419	154
6 ,, 15	632	1,050	1,339	+ 377	557	217
16 ,, 30	405	1,754	1,743	27	+ 1,077	1,080
31 ,, 50	422	1,296	3,260	+ 730	5,680	1,407
51 ,, 100	660	4,391	9,017	+ 581	15,103	2,858
101 ,, 200	683	7,056	12,584	3,125	26,825	7,172
201 ,, 300	276	5,435	4,664	7,338	38,685	4,262
301 ,, 320	− 59	2,713	− 3,803	9,375	53,057	− 710
321 ,, 400	228	4,521	3,546	5,891	36,963	2,383
401 ,, 500 .. .	210	5,224	455	5,464	8,995	763
501 ,, 600	239	4,244	3,252	4,657	25,314	568
601 ,, 640	859	6,335	− 1,599	3,194	63,110	253
641 ,, 700	349	2,558	− 575	2,434	+ 5,436	− 234
701 ,, 800	359	4,845	− 1,081	3,024	5,396	− 978
801 ,, 900	121	3,715	− 1,044	1,863	21,133	786
901 ,, 1,000	38	3,134	− 936	4,225	77,726	− 346
1,001 ,, 1,500	201	9,315	1,784	5,528	81,541	740
1,501 ,, 2,000	146	6,522	422	1,492	14,009	225
2,001 ,, 2,500	38	2,830	1,108	213	65,575	590
2,501 ,, 3,000 .. .	35	1,749	1,189	+ 2,857	+ 43,733	296
3,001 ,, 4,000	19	1,665	− 206	2,731	35,518	303
4,001 ,, 5,000	17	1,016	514	926	+ 19,267	− 8
5,001 ,, 7,500	24	1,572	1,013	+ 4,282	+ 92,263	942
7,501 ,, 10,000	4	1,423	396	+ 223	11,478	99
10,001 ,, 15,000	− 1	463	− 529	335	40,294	− 11
15,001 ,, 20,000	− 14	− 717	− 388	1,693	186,770	− 174
20,001 ,, 30,000	− 2	329	3	+ 146	74,511	12
30,001 ,, 40,000	− 4	− 547	− 280	+ 870	136,368	− 103
40,001 ,, 50,000	− 2	− 248	− 74	2,219	101,960	42
50,001 and upwards ..	− 1	− 322	− 50	966	47,569	− 25
Total	6,571	84,385	37,010	56,588	1,014,780	22,563
On holdings of Crown land only (not classified) ..	321	636	− 1,072	2,246	11,925	248
In cities, towns, &c., and travelling	..	2,644	− 5,062	13,593	19,054	− 660
Grand Total	6,892	87,665	30,876	72,427	1,045,759	22,151

Increase or Decrease in 1913 as compared with 1910.

Plus (+) sign indicates increase, and minus (−) sign indicates decrease.

Flocks of Sheep in Victoria, 1912–13.

Classification of sheep according to the sizes of the flocks.

Size of Flocks.	Number of Flocks.	Number of Sheep.	Percentage of Sheep to each Group.
Under 500	19,582	2,692,122	22·70
500 to 1,000	3,016	2,098,348	17·70
1,001 ,, 2,000	1,302	1,844,901	15·56
2,001 ,, 3,000	358	890,989	7·51
3,001 ,, 5,000	270	1,057,673	8·92
5,001 ,, 7,000	102	608,199	5·13
7,001 ,, 10,000	89	747,315	6·30
10,001 ,, 15,000	61	753,801	6·36
15,001 ,, 20,000	29	497,143	4·19
Over 20,000	25	668,170	5·63
	24,834	11,858,661	100·00
Sheep in cities, towns, &c., and travelling flocks*	..	33,563	..
Total sheep	..	11,892,224	..

Office of the Government Statist,
Melbourne, 13th November, 1913.

A. M. LAUGHTON,
Government Statist.

THIRD VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1913-14.

Monthly Report ending 14th December, 1913.

The eighth monthly report of the above Competition is as follows:—

During the past month the weather conditions have varied considerably, the temperature one day rising up to 100° Fahr., but, generally speaking, it was mild, with strong winds from the north, quickly changing to cold from the south.

The excellent output of eggs is still maintained, as 8,132 were laid for the month from 384 birds. The leading pen still maintains its lead, being 87 ahead of the next pen, and 9 pens have reached 1,000 eggs and over for the past eight months; a splendid all-round performance. The principal feature of the month has been the decided inclination for broodiness exhibited by the Leghorns, as 19 pens have had one or more affected, but some did not require to be cooped. The second leading pen (No. 11) has one in a strong moult after broodiness, while two other pens (Nos. 8 and 41) are similarly affected. Several other pens have one or more broody.

The general health of the birds is good, but some birds exhibit a rather dry appearance in feather, otherwise they are bright-headed, alert and vigorous, and all maintain their appetites.

The rainfall has been low, only 49 points being registered, while the same period last year showed 417 points. The feeding is on similar lines to last month, excepting a slight reduction in meat; the green food consisted of kale, cabbage, and at times green lucerne in the morning and mid-day feeds, grain at night, principally wheat, with a proportion of oats, and once a week, when the weather is cold, crushed maize as a change instead of oats.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913-14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner	Eggs laid during Competition. April 15 to Nov. 14.	Nov. 15 to Dec 14.	Total to date—8 months.	Position in Competition.
23	White Leghorns ..	J. H. Gill	999	143	1,142	1
11	,, ..	C. J. Beatty ..	921	134	1,955	2
6	,, ..	J. S. Spotswood ..	916	138	1,054	3
48	,, ..	Thirkell and Smith ..	902	138	1,040	4
8	,, ..	E. H. Bridge ..	894	135	1,029	5
35	,, ..	Moritz Bros. ..	864	151	1,015	6
10	,, ..	T. A. Pettigrove ..	883	131	1,014	7
65	,, ..	F. A. Lawson ..	906	106	1,012	8
31	,, ..	W. G. Swift ..	863	139	1,002	9
7	,, ..	H. McKenzie ..	850	141	991	10
61	,, ..	Jno. Campbell ..	870	102	972	11
50	,, ..	A. H. Mould ..	845	126	971	12
34	,, ..	J. F. Bradley ..	843	127	970	13
21	,, ..	A. Ross	832	134	966	14
20	,, ..	C. B. Bertlesmeier ..	814	146	960	15
5	,, ..	G. W. Robbins ..	798	156	954	16
40	,, ..	Geo. Edwards ..	805	138	943	17
66	,, ..	W. Featherstone ..	809	132	941	18
49	,, ..	M. H. Noye ..	821	115	936	19
2	,, ..	R. W. Pope ..	780	149	929	20
32	,, ..	H. Handbury ..	802	122	924	21
24	,, ..	Redfern Poultry Farm	768	143	911	22
26	,, ..	B. Rolls	780	129	909	23
67	,, ..	C. Hepburn ..	761	146	907	24
41	,, ..	Percy Walker ..	772	134	906	25
37	,, ..	C. H. Busst ..	789	115	904	26
58	,, ..	Stranks Bros. ..	769	133	902	27
63	,, ..	A. Sellers	766	122	888	28
43	,, ..	Morgan and Watson ..	760	114	874	29
47	,, ..	W. McLister ..	744	125	869	30
14	,, ..	F. Hannaford ..	732	136	868	} 31
33	,, ..	South Yan Yean Poultry Farm ..	725	143	868	
13	Black Orpingtons ..	T. S. Dallimore ..	739	121	860	33
46	,, ..	T. W. Coto ..	757	96	853	34
38	White Leghorns ..	M. A. Monk ..	731	116	847	35
45	,, ..	D. Goudie	720	125	845	36
52	,, ..	W. G. Osborne ..	709	134	843	37
59	,, ..	Cowan Bros. ..	721	117	838	38
42	,, ..	A. Stringer ..	711	125	826	} 30
12	,, ..	A. H. Padman ..	700	136	836	
18	,, ..	B. Rowlinson ..	712	118	830	41
62	,, ..	G. A. Gent ..	695	133	828	42
27	,, ..	J. Sinclair	692	131	823	43
56	,, ..	Schaefer Bros. ..	678	140	818	44
3	,, ..	S. Buscumb ..	686	121	807	45
57	,, ..	Gleadell Bros. ..	667	138	805	46
22	,, ..	B. Mitchell ..	676	124	800	47
44	,, ..	W. A. Rennie ..	667	132	799	48
53	Black Orpingtons ..	A. Greenhalgh ..	658	122	780	49
54	White Leghorns ..	James McAllen ..	655	124	779	50
25	Black Orpingtons ..	King and Watson ..	681	92	773	51
29	White Leghorns ..	S. Brundrett ..	629	139	768	52
55	,, ..	P. H. Killeen ..	649	114	763	53
36	,, ..	A. J. Jones ..	637	124	761	54
30	Black Orpingtons ..	Jas. Ogden ..	618	141	759	55
51	Black Spanish ..	W. H. Steer ..	640	116	756	56
28	White Leghorns ..	E. Waldon	609	98	707	57
19	,, ..	W. H. Dunlop ..	593	113	706	58
60	Black Spanish ..	Watson and Rushworth	569	135	704	59
64	Golden Wyandottes	C. L. Sharman ..	593	104	697	60
17	R.C.Brown Leghorns	S. P. Giles	583	108	691	61
9	White Leghorns ..	Sylvania Stud Farm	505	134	639	62
4	,, ..	Jas. Brigdon ..	521	114	635	63
15	White Leghorns ..	J. Shaw	524	104	628	64
		Totals	47,308	8,132	55,440	

VICTORIAN WHEAT HARVEST, SEASON 1913-14.

PRE-HARVEST ESTIMATE.

Based on Information furnished by Farmers.

Wheat-growing Districts and Countries.	Estimated Area for Grain.	Estimated Yield of Wheat.	
		Per Acre.	Total.
	acres	bushels	bushels
Central District (part)—			
Grant	12,100	13·25	160,325
North-Central District (part)—			
Talbot	21,000	17·50	367,500
Western District (part)—			
Grenville	38,000	16·50	627,000
Hampden	24,400	18·25	445,300
Ripon	72,600	17·00	1,234,200
Wimmera District—			
Lowan	169,500	14·50	2,457,750
Borung	346,000	17·75	6,141,500
Kara Kara	148,700	15·75	2,342,025
Mallee District—			
Weeah	143,000	6·75	965,250
Karkarooc	472,000	6·75	3,186,000
Tatchera	289,000	10·00	2,890,000
Northern District—			
Gunbower	51,300	13·00	666,900
Gladstone	130,000	16·00	2,080,000
Bendigo	158,800	17·00	2,699,600
Rodney	159,100	15·50	2,466,050
Moira	323,500	15·25	4,933,375
North-Eastern District (part)—			
Delatite	18,400	16·00	294,400
Bogong	59,600	15·25	908,900
Remainder of State	36,000	17·50	630,000
Total estimated area and yield 1913-14 ..	2,673,000	13·28	35,496,075
Total area and yield 1912-3	2,085,216	12·58	26,223,104

A. M. LAUGHTON,
Government Statist.

Office of the Government Statist,
Melbourne, 3rd December, 1913.

It is very gratifying to learn that the amount of wheat likely to be harvested this season will be a record in the history of the State. According to the above pre-harvest estimate of the Government Statist (Mr. A. M. Laughton), the estimated area under grain for 1913-14 is 2,673,000 acres. This is the highest acreage sown to wheat in the history of the State. The estimated average yield is 13·28 bushels per acre, and the aggregate crop is estimated at 35,496,075 bushels, which at current market rates is worth over £6,000,000.

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VINTAGE NOTES.

By F. de Castella, Government Viticulturist.

WHEN SHOULD ONE COMMENCE VINTAGE ?

The degree of maturity reached by the grapes when they are vintaged has, as is well known, a preponderating influence on the character of the resulting wine.

In order to make a wine of a given alcoholic strength, the juice must possess a corresponding gravity. Such a statement may appear a truism to a wine-maker; there are other facts, however, in connexion with the ripening of grapes which are less obvious, but of which the consideration may throw useful light on some otherwise obscure developments.

In some seasons, for example, the required Beaumé degree seems to be unattainable, and even prolonged hanging on the vine does not result in the anticipated increase in gravity. Maturation is, in reality, much more than a mere question of increasing concentration; it is a complex physiological process, which should be properly understood if the best results, both as regards quantity and quality, are to be realized.

A few facts in connexion with the principal features of the process may here be recalled. From the time of the setting of the blossom, the fruit of the vine goes through three phases or periods before it reaches perfect maturity. This is followed in its turn by a fourth stage, that of super-maturity or over-ripeness.

* The first or herbaceous period commences with the setting of the fruit. It is marked by a steady and considerable increase in the size of the berry, and by its green colour, due, as in the case of other green tissues, to chlorophyll. Owing to the presence of this substance, the fruit during this first stage functions like any other green part of the vine, assimilating carbon from the air and elaborating starch and other substances, including acids. During this period the composition varies but little; it is approximately the same as that of other green parts, containing about 1 per cent. of sugar, of which .8 per cent. is

* Guillon, *Etude Generale de la Vigne*, p. 285.

dextrose and .2 per cent. levulose. The acidity, which is high (2.5 per cent. calculated as sulphuric acid), is due mainly to tartaric and malic acids, both free and partially neutralized in the shape of acid salts.

The second period is characterized by the disappearance of chlorophyll—the hard, green appearance of the herbaceous stage gives place to a soft, semi-transparent condition, whilst the increase in size of the berry ceases. Its composition, however, alters very considerably, the sugar-content increasing steadily whilst the acidity decreases. The mechanism by which these changes are brought about cannot be here gone into; we know, however, that the sugar is mainly derived from the leaves, in which it is elaborated, and whence it finds its way to, and is stored in, the fruit. The general appearance of the vine bears testimony to the important changes which are taking place, the drain on the foliage being evidenced by more or less marked signs of distress—the vitality of the plant appears to be less, at this stage, than at any other period of growth. Towards the close of this period, the colouring matter commences to appear in red grapes.

The third period differs mainly from the second by the berry again increasing in size, otherwise the changes which occur are much the same; the sugar percentage increasing very considerably, whilst the acidity still further diminishes. Some authors, in fact, look upon this and the previous period as only constituting one stage. After a while, the increase in sugar and decrease in acid become slower, and finally cease, the composition of the juice becoming, for a time, constant; in other words, the fruit is ripe. French authors distinguish between physiological maturity, characterized by the ripening of the seeds or pips, and industrial maturity, or the most profitable time for vintaging. Except in the case of some special wines, such as Sauternes and a few others, which are necessarily made from over-ripe grapes, the great bulk of the grapes of France are vintaged as soon as complete physiological maturity has been reached, sometimes even before; the correct determination of the exact moment of complete maturity is thus a matter of vital importance. Nor is it so easy a matter as might be thought at first sight. The fixing of an arbitrary gravity standard, though possible in the case of over-ripe grapes, cannot prove satisfactory. According to situation and season, the same variety in any given district may present considerable difference in the gravity of must corresponding with complete maturity.

Different means for determining the exact moment of maturity are often described. Practical men are mainly guided by outward signs, difficult to describe in detail, but which usually give satisfactory results in capable hands.

Gravity and acid determinations, repeated at fairly short intervals, are, no doubt, the most reliable methods. When both become constant, as has been already explained, maturity is complete. Pollacci's method is often referred to. It is based on the fact that ripening commences at the outside of the berry and works inwards. Comparison of the pulp in contact with the skin with that surrounding the pips shows a marked difference in taste until the moment of maturity, when no further difference can be noticed.*

* Wine Making in Hot Climates.—Roos translated by Dubois & Wilkinson, Chaps. II. & III.

The changes which occur during the second and third periods of maturation are truly remarkable, the sugar percentage increasing from 1 to 20 and over, whilst the decrease in acid, though much less considerable, is none the less interesting on account of its complexity; there appears, in fact, to be much room for research work in connexion with the acid constituents of grape juice and wine. The chief of these are, no doubt, tartaric and malic acid and cream of tartar. Malic acid is most plentiful in the grapes of cold regions, where maturity is difficult. To its presence is due the pleasant acidity of Mosel and similar wines, grown near the northern climatic limit of possible wine culture.

The following extracts from Gayon and Laborde's recent work on wine analysis* show how incomplete is our knowledge of the subject. Speaking of the determination of cream of tartar, they say, "It is impossible to know exactly the quantity of cream of tartar a wine contains, since this quantity depends on a chemical equilibrium which exists between different constituents of the wine, and because all methods for its estimation, which have been proposed, upset this state of equilibrium." Again, in connection with tartaric acid, they say, "The determination of free tartaric acid is quite as uncertain as that of cream of tartar"; and, further, referring to malic acid, "Its determination in presence of other fixed acids is always very difficult." These quotations from a recent and authoritative work show how unsatisfactory is the present state of our knowledge concerning the acid constituents of grapes and wine.

The fourth or super-maturation period presents more importance under Australian than under European conditions, for it is our very general practice to postpone vintage until our grapes are overripe, unless climatic conditions of the season or of the district compel prompt gathering of the crop. Nor are our wine-makers to be blamed for this practice; it is to a great extent forced upon them by the demands of the trade, which mainly requires sweet wine, and shows a very general preference for high alcoholic strength and low acidity, even in the case of dry wines.

The changes characteristic of the super-maturation period thus present considerable importance for us. Two features in particular may be here emphasized:—

1st. Once complete maturity is reached, the fruit ceases to receive sugar from the vine. The gravity of the juice increases, no doubt, provided climatic conditions are suitable, but this is only a relative increase, due to concentration by evaporation; there is no actual gain in sugar.

2nd. There is, in fact, an actual loss of sugar due to partial oxidation or combustion. This loss is one which occurs regularly, even when weather conditions are absolutely favorable; in rainy autumns a further, and probably more considerable, loss of sugar has to be faced if super-maturation be resorted to in order to increase gravity. In seasons such as that preceding the 1913 vintage, heavy autumn rains cause the vines to start a fresh growth at the ends of shoots and laterals, and it is highly probable that some of the sugar of the fruit actually reverts to the circulation of the vine for the benefit of such fresh growth, which would thus, at least in its early stages, play the part of a parasite, actually withdrawing some of the sugar previously elaborated

* Vins. V. Gayon & J. Laborde, Paris, 1912.

and stored in the fruit. Such, at least, appears to the writer to be a reasonable explanation of the fact, only too forcibly impressed on many practical growers last season, that prolonged hanging on the vine, though it resulted in a loss in weight of grapes per acre, did not lead to the anticipated increase in must gravity.

Other changes during the fourth period are also worthy of note. The acidity decreases continually, owing to oxidation, and also to neutralization by potash salts derived from the soil. "Nitrogenous substances (mainly pectic) and colouring matter undergo changes which renders them, at least, partially insoluble."* The relative proportion of the sugars also undergoes considerable change, that of dextrose decreasing simultaneously with an increase in that of levulose, which becomes the more plentiful.† The flavour of the fruit also undergoes change, acquiring a characteristic, over-ripe taste, and finally the skin changes, losing its resistance to moulds, which invade it should weather conditions become favorable.‡

From the above it will be seen that the most advantageous time for vintage is when the grapes have obtained complete maturity and before they are over-ripe. Not only is the greatest weight of grapes per acre then obtainable, but, since the proportion of juice contained in these grapes has reached its maximum, it is now that the greatest possible gallonage per acre is yielded. To allow the grapes to remain longer on the vine means a reduction in the yield of juice per acre. It also means a reduction in the total sugar production owing to the loss which occurs during the super-maturation stage. The reduction in yield will be patent to all, but the loss in total sugar is less evident, and apt to be lost sight of.

There is, however, another and a weighty reason for vintaging as soon as the grapes are ripe: for it is at this moment that the composition of the juice is best suited for rapid, healthy, and complete fermentation, mainly by reason of the acidity being adequate, and dextrose more plentiful than levulose. French writers are emphatic on the point that at complete maturity the best possible wine can be made from the grapes with which one has to deal.

In the case of wines of similar type to those of France—light, dry, table wines, such as have made the reputation of the Yarra Valley, Great Western, and similar cool districts—there can be no doubt whatever as to the advantage of not allowing the grapes to become over-ripe. By doing so, one not only loses quantity—and the loss in this direction is much more considerable than is usually realized—but quality is also sacrificed, and the light character which constitutes the chief charm of the wines of these districts is hopelessly lost. The excellence of the wines of the Hunter River district of New South Wales is probably in no small measure due to early autumn rains, which compel the gathering of the grapes as soon as they are ripe.

In warmer districts the foregoing remarks require considerable qualification, since growers are mainly asked for wines of other than light table type, though, so far as these are concerned, they still hold good. The Australian demand is mainly for sweet wines. These, as

* Guillon, *Loc. cit.* p. 298.

† The greater ease with which yeast can ferment dextrose explains the often difficult fermentation of over-ripe grapes, rich in levulose.

‡ Raymond Brunet, *Revue de Viticulture*, XXXVII., p. 19.

well as the full-bodied, dry, red wines, which constitute the bulk of our export trade with London, and which constitute a type distinct from anything produced in Europe, necessitate a certain degree of super-maturation before the grapes are picked. Wine containing 25 per cent. of proof spirit cannot be made unless the gravity of the juice be allowed to reach about 14 degrees Beaumé, and usually more, since allowance must be made for losses during fermentation, inevitable in warm weather. To reach 14 degrees, a certain amount of concentration or over-ripeness is usually necessary, hence the rules laid down by French œnologists no longer apply.

In a general way it may be said that there is a marked tendency in Victoria to unduly delay vintage. Our genial climate and usually rainless autumn permit of the grapes being allowed to hang on the vine to an extent unknown in European countries. In the case of sweet and other full-bodied wines, a certain amount of over-ripeness is inevitable; it is, in fact, a necessary evil, but, even so, it is a very common practice to allow concentration to continue to a quite unnecessary degree. What it is here desired to point out is, the very high cost in the shape of reduced yield and actual loss of sugar which such over-ripeness entails.

The drawbacks of gathering before complete maturity are evident. If they have not been dealt with here it is because vintage is seldom commenced too soon in our wine vineyards. In dried grape vineyards, however, the desire to take advantage of good drying weather sometimes causes picking to be started too early. The loss of sugar and, consequently, of weight and quality, entailed, should be too obvious to need further reference.

PREPARATION OF VATS, CASKS, ETC.

The preparation of the wine-making vessels, many of which lie idle from vintage to vintage, is a subject of importance at this season. Careless treatment may present a loophole for infection by any of the numerous disease organisms with which the wine-maker has to contend.

The importance of absolute cleanliness in all wine-making operations should scarcely need reiterating here. It has long been recognised in the sister dairying industry, and the scrupulous care observed in the thorough cleansing of all utensils, now considered to be absolutely essential in that industry, is not less essential in wine making.

In previous articles it has been shown how the development of undesirable micro-organisms during fermentation can be largely combated by the judicious use of sulphurous acid.*

It is surely logical to secure the absence of all possible injurious micro-organisms by means of thorough cleanliness before commencing vintage.

Such ordinary routine work as washing, the use of soda, caustic soda, sulphuric acid, and the sulphuring of casks are too familiar in our cellars to need description here. In these notes, reference must be limited to a few less usual cases requiring special treatment.

* Sulphiting, *Journal of Agriculture*, January, 1911. Also "Vintage Considerations," *Journal*, February, 1913. Reprints of these articles are obtainable on application to the Department.

A fruitful source of contamination is to be found in the usual method of swelling press platforms, wooden vats, tubs, &c., with water. These utensils have, as a rule, remained empty since the previous vintage. They must be soaked in order to swell the wood and prevent leakage. The taste of stagnant water (*Gout de croupi*, in French) often observed in wines, and which, of course, detracts considerably from their value, is mainly due to putrefaction of the water used in swelling casks, &c. All cellarmen know how rapidly water contained in wooden vessels becomes putrid; the disgusting flavours produced are only too easily communicated to the wine. Mathieu, in an interesting article on this subject * points out how rapidly infection takes place, especially in warm weather, such as we experience just before vintage and when preparation for it is being made. He describes in detail the developments leading to these most undesirable tastes. At first, and on the surface, ærobic organisms develop, which produce inodorous substances, but their place is subsequently taken by anærobic ones. "The digestion products of which have great analogy with the products of our own (human) intestinal digestion, formation of compound ammonias, mercaptan, indol, scatol, gases such as sulphuretted hydrogen, phosphides, &c. . . . . These bad-smelling substances penetrate deeply into the wood . . . . and are gradually given up by it to the wine . . . . such is the origin of the *Gout de croupi* presented by such wines. The warmer the weather, the more rapidly do these objectionable bacteria develop."

Fortunately, there are simple means of avoiding such undesirable developments. Mathieu recommends never to use water for soaking utensils, &c., without the preliminary addition of a disinfectant, and for this purpose he recommends either bi-sulphite of potash, at the rate of 1 lb. to 176 gallons of water, or, what is cheaper, commercial bi-sulphite of lime solution, at the rate of 1 quart to 220 gallons. Bi-sulphites are very largely used in breweries, and their more extensive use in the water used in preparation for vintage, and for washing in the cellar of any kind, cannot be too strongly urged. For addition to the grapes or wine, bi-sulphite of potash is the only sulphurous salt admissible. Other bi-sulphites would alter the composition of the wine, but for washing and scouring purposes, the cheaper bi-sulphite of lime is the most profitable form to use.

The disinfection of faulty casks is a more difficult matter. Faulty tastes, and, what is even worse, the micro-organisms which cause them, as well as those of such wine diseases as scud (Tourne), &c., penetrate deeply into the pores of the wood, where they can only be reached with difficulty, or not at all, by antiseptic solutions. Here, as in so many other cases, prevention is much better than cure, and to discard a bad cask is always the safest course. Nevertheless, the use of a faulty or doubtful cask may, in an emergency, be forced upon one, and the following hints may be found of use.

Before any of these methods are applied, the tartar should be chipped out. Behind the flakes of this substance small cavities exist, which are excellent hiding places for dirt and micro-organisms of all kinds. The value of the tartar or argol (worth about £25 to £30 per ton) will amply repay the cost of its removal.

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* *Progrès Agricole*, Vol. LV., p. 43.

Boiling lime water.—The writer has found this method very satisfactory for large casks. It is, of course, only possible if steam under pressure is available. The cask is filled with water, to which lime has been added at the rate of 2 lbs. to the 100 gallons. A steam pipe is inserted through the upper bunghole and made to reach the bottom of the cask. Steam is then allowed to bubble through under pressure until the water boils, which will take some twelve or fifteen hours in the case of a 1,000-gallon cask. The hot lime water may be left in the cask for some days, or until it is cool, when it is emptied out and the cask washed thoroughly. Any remaining lime should be neutralized by washing with either 1 or 2 per cent. sulphuric acid solution, and the cask sulphured, &c., in the usual way. Casks treated in this way are rather liable to the growth of mould, and require frequent sulphuring if empty. It is worthy of note that this treatment removes all the colour from red casks, so that they may be used for white wine.

Simple steaming is strongly to be recommended. In this case, the steam should be introduced by the lower bunghole (in the manhole door), the top bunghole being closed. It must be remembered that it requires high pressure and a very prolonged steaming for anything like complete sterilization to be obtained. The treatment is also rather severe on the casks, which rapidly dry out and become leaky if not filled with wine shortly after being steamed.

Pricked casks, or those showing traces of acetic fermentation, should be neutralized with a 5 per cent. washing soda solution before being steamed. In this case, the boiling lime water method will give excellent results.

Chlorine Disinfection.—Chlorine has a powerfully destructive action on organic substances, especially on those of complex nature responsible for bad odours in casks. Chlorine gas can be conveniently obtained by the action of sulphuric acid on chloride of lime (bleaching powder). Semichon recommends a 5 per cent. solution of chloride of lime ($\frac{1}{2}$ lb. to 1 gallon), which is poured into the cask and to which is added an equal quantity of a 10 per cent. solution of sulphuric acid (1 lb. or 10 fluid ounces to 1 gallon). A pint of each solution will suffice for a hogshead. The cask should be immediately bunged up and allowed to remain for several days. Chlorine, being a gas, will reach all parts; but before treatment the whole of the inner surface should be thoroughly wet. Very thorough washing or, preferably, steaming is then necessary, followed by sulphuring, which removes any final traces of chlorine, according to the formula,

$$\underset{\text{Sulphurous Acid.}}{H_2SO_3} + \underset{\text{Water.}}{H_2O} + \underset{\text{Chlorine.}}{Cl_2} = \underset{\text{Sulphuric Acid.}}{H_2SO_4} + \underset{\text{Hydrochloric Acid.}}{HCl}$$

For casks of 500 to 1,000 gallons half a gallon at least of each solution should be used.

Permanganate Disinfection.—Professor Degrully, of Montpellier School (*Progres Agricole*, 3rd August, 1913), has recently recommended this treatment for faulty casks. In the case of hogsheads, these should be nearly filled with water, and about an ounce of permanganate of potash crystals added. The hogshead is then rolled about, a couple of times a day, for three or four days. Complete washing, to remove

all traces of permanganate, is next required; it is followed by sulphuring, &c., in the usual way. Large casks may be treated, after removal of tartar, with a 1 per cent. permanganate solution, which must be repeatedly pumped over the whole inner surface by means of a small force-pump fitted with a fine nozzle.

Formalin disinfection is much employed in breweries. It may be either applied by washing and brushing internally with a 3 per cent. solution of commercial 40 per cent. formalin, or, in the gaseous form directions for which method are given on each bottle of Victorian made formalin. The casks should subsequently be washed with hot water or steamed to remove the formol, the presence of which in wine is contrary to law.

Treatment of Cement Vats.—The need for treating new cement vats before wine or grapes are allowed to go into them is well known. If this is neglected, much of the acid is neutralized by the free lime of the cement, with disastrous results to the wine.

The usual treatment consists in thorough washing with a 25 per cent. solution of tartaric acid. Coating with paraffin, which is largely followed in Victorian wineries, is an excellent practice; but, before it is carried out, it is well to "kill" the excessive lime with tartaric acid solution. Cracks in the paraffin easily form, by means of which the wine comes in contact with the cement.

Silicate treatment gives excellent results. It consists in washing the surface with a solution of silicate of potash (waterglass: the same as is commonly used for preserving eggs). This process, "discovered by Kuhlmann. . . . . is based on the action of potassium silicate on lime salts; there is formation of a silico-carbonate of lime with liberation of soluble carbonate of potash: further, the carbonic acid of the air acts, setting free gelatinous silica, which contracts and hardens sufficiently to scratch glass; the surface layers of the cement are thus transformed into an impermeable glaze, unattacked by air, water, or acids, consequently by must or wine."* It is well to use a dilute solution at first, this being better able to penetrate the cement to some depth. The solution acts more promptly if applied as hot as possible. Three applications are sufficient, two or three days after each of which the whole surface should be copiously washed with water, in order to dissolve the carbonate of potash which has formed.

The first application should be of the commercial silicate solution, of 35 degrees Beaumé, diluted with three times its bulk of boiling water. For the second and third application, the commercial silicate will be diluted 1 to 2 and 1 to 1 respectively.

Even after this treatment, coating with paraffin is to be recommended—it fills up any cracks and fissures, and prevents to a consider-extent actual contact with the cement. All cement contains iron, the presence of which in the wine is so apt to lead to trouble with colour, especially in the case of white wine.

Before vintage, it is always well to fill cement vats, whether they be old or new, with water for a week or so. It will frequently be noticed that the level of this water falls during the first couple of days—a corresponding loss of wine is thus avoided. The water used to soak these vats should have bisulphite added to it, as previously indicated.

* Mathieu, *Revue de Viticulture*, Vol. XIV., p. 438.

THE SELECTION AND TREATMENT OF POTATO SEED.

By J. T. Ramsay, Potato Expert, Victoria.

Regarding the selection and treatment of seed potatoes, it is somewhat surprising that there are so few growers aware of the proper method of dealing with seed.

Beyond question, the most important factor in the successful cultivation of potatoes is the quality and condition of the seed. Yet, notwithstanding this apparently obvious fact, it must be admitted that there is no part of the work in connexion with potato growing which is carried out in so haphazard a manner generally as is the selection and care of seed.

As a rule, seed potatoes are planted without very much serious consideration of their fitness, and are subjected to treatment which impairs their vitality and renders them therefore less prolific and less profitable This refers to the common practice of keeping and storing potatoes intended for seed in pits, heaps, or bags. It must be borne in mind that this statement refers only to potatoes intended for seed, and not to those intended for consumption.

In selecting seed potatoes, it is essential, if the best results are to be obtained, that the tubers for seed should be dug out of the ground before the crop is thoroughly ripe, that is, while the haulms or tops of the plants are yet green. This is a rule which applies to *every* variety, whether it be early, mid-season, or late, and it applies to *every* district where potatoes are grown.

Experiments carried out by Mr. Seymour, formerly Potato Expert of this Department, have clearly demonstrated the higher efficiency of immature seed, and added further proof to the findings of experimenters and growers in other centres, that crops grown from immature seed give a heavier yield per acre than crops produced from seed which has ripened in the ground. The difference in tonnage per acre is generally from 30 cwt. to 2 tons in favour of immature seed, though this is variable—one test at Cheltenham gave over 5 tons per acre.

Another advantage gained by selecting potatoes for seed before ripening is that the best plants can be seen, that is, the strongest plants, and selection of the best seed from these can easily be made, whereas, in selecting seed from a bulk sample this discrimination is not possible.

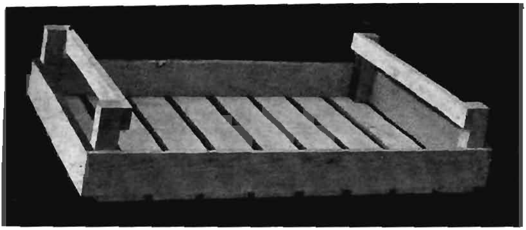
In order to preserve the seed in proper condition until planting time, it is very advisable to allow it to be greened by spreading on the ground and exposing it to the light (not to scorching sunlight). The effect of the light is to toughen the skin and change the colour to a dark green, in which state the seed is in ideal condition for keeping, and can better withstand the attack of disease or changes of weather. It should scarcely be necessary to state here that potatoes intended for table purposes or for feeding stock should not be greened, as their feeding qualities are thereby impaired and they are indeed rendered slightly poisonous.

There are various methods of storing the seed, but only two worthy of consideration, namely, "boxing" and pitting, and a comparison of the two methods and their effects is given herewith.

By "boxing" is meant the storage of seed in shallow boxes or trays, the uniform size of which is 31 inches x 21 inches x 3 inches deep, and of which it takes about 40 to hold a ton of potatoes.

Some undesirable effects of pitting seed are—

(1) Disease, if present, is likely to spread.
(2) Potatoes cannot be conveniently examined from time to time to be sorted, if necessary, without considerable labour.
(3) Sprouts will grow at every eye of each tuber (excepting blind eyes).
(4) Length of shoots cannot be regulated.
(5) Sprouted potatoes cannot be handled from pits at seeding time without injury to a large percentage of the sprouts thereby adversely affecting the set.



POTATO SEED BOX.

Some advantageous effects produced by "boxing" seed are—

(1) Disease is practically arrested.
(2) The seed can easily be examined at any time without disturbing the tubers, and no further sorting is required.
(3) Sprouts will, in most cases, only grow out of the main eye or terminal bud of the potato, and in all cases the sprouting will be confined to a few eyes at rose end of tuber.
(4) The length of sprouts can be regulated by increasing the temperature and keeping dark to promote growth, or by lowering the temperature and admitting light to retard.
(5) The potatoes can be handled at planting time without injury to the shoots. The shoots should be exposed to light to toughen and green them a week or so before planting time.

The sprouting of seed potatoes cannot be too strongly recommended. If the seed be sprouted before planting, the grower has a clear indication of the vigour of each individual seed set, and can consequently and with accuracy select seed which has the best chance of producing a good and clean crop, and can reject weaklings.

It is obviously good practice to sprout seed for that last reason alone, but there are still other advantages to be gained from it. The crop

grown from sprouted seed will yield a higher percentage of marketable sized potatoes, a heavier tonnage per acre, and will mature in less time than that from unsprouted seed. The fact that it is a less time in the ground lessens its risk of disease, and that is a very important point.

The sprouted set may be kept out of the ground at planting time for several weeks, if the weather is unfavorable, without the digging time being thrown later. The fact of them maturing in less time, if sprouted, is important to growers for early market, as it will enable them to supply the demand for new stuff when prices are high.

There is, in fact, everything in favour of immature and sprouted seed.

The above is an illustration of a standard seed potato box. It is apparent that potatoes stored in boxes of this sort are amply ventilated, as is necessary for successful storage. The boxes may be stacked on top of one another to such height as may be convenient, thereby economising space. They are obtainable in Melbourne at about £4 per hundred, and, as 25 to 30 boxes are sufficient to hold seed for an acre, the initial cost per acre works out at from £1 to £1 5s. If the increased yield is only one ton, it is obvious that the use of this system is very profitable.

REVIEW OF BUTTER TESTS AT CAMPERDOWN AGRICULTURAL SHOWS, YEARS 1896 TO 1912.

By R. R. Kerr, Dairy Supervisor.

Butter tests have always been an important item in the schedule of the Hampden and Heytesbury Agricultural Society since the year 1895, and have been the means of creating some friendly rivalry between the various exhibitors for the substantial prizes donated. One can reasonably assume that, taking into consideration the importance of the butter industry in this district, a larger number of the farmers would compete, instead of the usual few. The small number of entries is not due to a dearth of good cows, as a visit to the locality in the spring months will convince one as to the number of splendid dairy animals on the wayside farms. The tests are usually held on the Society's ground about one month previous to the annual show, which is held in the last week of November. The rules of the competition are: That the cows be milked out in the presence of a judge and stewards appointed by the society. On the first day, the judge examines the cows to see that they are milked properly, on the following day the milk is weighed and samples taken to be tested for the fat content. The same milker to milk throughout the trial. If cows are fed in bails, must be fed from start to finish of test. Milking hours, 7 a.m. to 5 p.m. The testing is sometimes done by an expert in the presence of the exhibitors, immediately after the samples are procured; at other times at the local butter factory. On odd occasions the experts in the Agricultural Department have carried out the tests.

The main cause for the small number of entries seems to be the time spent in taking cows to the show-grounds. As the tests are held in the busiest time of the year, there is some ground for the complaint; but I do not consider this is time wasted, as these trials have a much higher educational value than is generally credited to them, often proving to a farmer, when he is seeking his best cow by the aid of the scales and the Babcock tester, that it is not always the cow giving the highest yield of milk that produces the most butter. On three occasions the competitions were conducted on the farms—a far more satisfactory method, the cows being in their natural surroundings gave a nearer estimate of their actual production. The number of entries was much larger; but here, again, another difficulty presented itself in getting suitable stewards to superintend the milkings at the various farms. A perusal of the records will convince one that no one breed is the best, and that individuality plays a greater part, although the trials under review prove the superiority of the Jersey and Ayrshire type.

The comparative low yields in some years is no reflection on the producing capacity of the competing animals, but more as a guide to the variations arising, when cows are solely pasture fed. Very little artificial feeding is resorted to, the natural herbage in this district containing practically all the essential nutrients of a well-balanced ration; consequently, as these tests are always held at the same time each year, they are to a certain extent, so far as production is concerned, controlled by the seasons.

The Society is deserving of every encouragement in its endeavours to instil into the farmers the necessity of testing their cows. The system, once begun, will be an eye-opener in proving which are the good and indifferent animals. Ofttimes a cow, occupying a lofty pedestal in an owner's eye, is a very poor second to her less stylish herd mate.

WINNERS OF BUTTER TESTS AT CAMPERDOWN SHOWS.

Year.	Owner.	Cow's Name.	Breed.	Milk, 24 hours.	Com. Butter.
				lbs.	lbs.
1896	J. Dinan ...	... ...	Jersey Cross .	42	2·294
1897	F. Lovett ..	Beauty ...	Jersey Cross ..	53½	3·088
1898	D. McDonald ..	Kitty ...	Jersey Cross ...	49	2·484
1899	Wm. Kerr .	Leura .	Jersey Cross ...	52½	2·500
1900	D. McDonald ...	Quail ...	Ayrshire Cross	46½	2·656
1901	A. Skene ...	Blanche .	Shorthorn Cross	67	2·749
1902	W. Podger ..	Lena ...	Shorthorn Cross	54¼	2·482
1903	W. Podger ...	Brindle ...	Jersey Cross ...	52¾	2·909
1904	A. Skene ...	Biddy ..	Ayrshire Cross	56½	2·840
1905	Wm. Kerr .	Mermaid ..	Shorthorn Cross	51	3·078
1906	Wm. Kerr	Mermaid ...	Shorthorn Cross	50	2·818
1907	Wm. Kerr ...	Linda ...	Jersey Cross	45¼	2·656*
1908	A. McGregor	Duchess ...	Jersey Cross	67	2·861
1909	Wm. Kerr ..	Brindle ..	Jersey Cross	43½	2·469
1910	Wm. Kerr ...	Lady ..	Jersey Cross	47¾	2·444
1911	W. P. Brisbane	Scottish Queen	Pure Ayrshire ...	59	3·342
1912	J. D. McDonald	Lasca ...	Ayrshire Cross	58	3·309

Average for 17 years—52·67 lbs. milk, 2·763 lbs. butter, in 24 hours, or 19·341 lbs. weekly.
All the above are approximate, and worked out on basis 14% overrun.
*Linda, the winner in 1907, had the use of only 3 quarters in udder.

In the year 1905 eight cows competed, and averaged 50 lbs. milk, 2.744 lbs. butter, in 24 hours, or 19.208 lbs. weekly.

Nos.	Owner.	Cow's Name.	Breed.	Milk.	Com. Butter.
				lbs.	lbs.
1	Wm. Kerr ...	Mermaid ...	Shorthorn Cross	51	3·078
2	D. McDonald ...	Sophie ...	Jersey Cross ...	47½	2·69
3	A. Skene ...	Gentle ...	Jersey Cross ...	54½	2·689
4	D. McDonald ...	Starlight ...	Ayrshire Cross	47¼	2·626
5	D. McDonald ...	Possum ...	Jersey Cross ..	48½	2·544
6	D. McDonald ...	Spider ...	Ayrshire Cross	46½	2·510
7	Wm. Kerr ...	Lass... ...	Jersey Cross ...	48¾	2·430
8	A. Skene ...	Auburn ...	Shorthorn Cross	57¼	2·388

Note.—No. 8, greatest yield of milk, lowest amount of butter.

One outstanding feature of the trials was the consistent performances of two cows, "Mermaid" and "Gentle." "Mermaid" was first on two occasions, once second, and twice third; her record stands as follows:—

Year.	Amount of Milk.	Butter.	Prize.
	lbs.	lbs.	
1903	57½	2·595	3rd
1905	51	3·078	1st
1906	50	2·818	1st
1907	48	2·579	3rd
1908	47	2·476	2nd

Average—50·7 lbs. milk, 2·709 lbs. butter daily = 18·963 weekly.

"Gentle," owned by the late Allan Skene, was second on three occasions, once third, and once fourth.

Year.	Amount of Milk.	Butter.	Prize
	lbs.	lbs.	
1901	50	2·451	2nd
1904	53½	2·554	2nd
1905	54½	2·689	3rd
1906	57	2·656	2nd
1907	52½	2·516	4th

Average—53½ lbs. milk, 2·573 lbs butter daily, 18·011 weekly.

Both cows were at least fourteen years old when last shown, thus exploding the freely-expressed opinion that milking cows are unprofitable at that age. Where dairy cattle are well fed and handled, their period of profit is greatly extended; and old milking cows are common in herds where hand feeding is practised, or in a district favoured by an abundance of succulent herbage. On the other hand, where dairy cows have to battle for a mere existence, their susceptibility to disease is increased, their days of usefulness impaired, and the profits to the owner infinitesimal.

ANNUAL GRANT TO AGRICULTURAL SOCIETIES.

SUBSIDY CONDITIONS FOR 1914.

CONDITION A.—COMPULSORY.

The awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.

Stallion Inspection Parades will be held at different centres throughout the State prior to the commencement of the Show season (Time Table of Stallion Parades for 1914 will be available shortly after 1st April, 1914). The parade centres are so arranged that all owners of Show stallions have the opportunity of submitting them for examination for the Government Certificate of Soundness before the closing of entries for the Show. Show Secretaries will require to obtain evidence of the possession of the Government Certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the Show, Secretaries of Societies are required to forward the names *of all the horses* that have won the prizes in stallion classes, together with the names of the owners, to the Director of Agriculture.

Failure to comply with the above requirements will result in forfeiture of the grant in aid.

CONDITION B.—OPTIONAL

AGRICULTURAL CLASSES.

A sum of £10 as a special subsidy will be added to the *pro ratâ* grant to such Societies as carry out agricultural classes in strict conformity with the following conditions and to the satisfaction of the Department:—

Applications must be submitted not later than 1st March, 1914.

Thirty students at least must be enrolled before a class can be held.

The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on.

A roll of attendances at lectures and demonstrations shall be kept.

The agricultural classes will extend over two weeks, a demonstration being given each morning and afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society.

At the conclusion of each class, a written examination of about 1½ hours' duration will be held, a medal to be awarded by the Department to the student in each district obtaining the highest number of

marks for examination work and regular attendance combined. Two-thirds of the maximum marks obtainable will be given for examination work, and one-third for regular attendance. No medal will be awarded in any case where the percentage falls below 60. The Department also reserves the right to withdraw the offer of the medals in the event of there being less than five students remaining for examination. Students in attendance at Agricultural High Schools and Colleges, or at the Continuation Schools, and teachers from such institutions or State Schools shall not be allowed to sit for such examination.

A special examination for the Gold Medal offered by the Australian Natives' Association will be held at the close of the year, and only winners of Departmental medals will be eligible to compete thereat.

Subjects of First Week.

Agriculture.
Live Stock and Veterinary Science.

Subjects of Second Week.

Two or more of the following, to be selected:—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export); (*b*) Dairy Farming (including Management and Breeding of Pigs); (*c*) Poultry Breeding and Management; (*d*) Orchard and Garden Work.

LECTURES.

A special subsidy of £1 5s. per lecture will be added to the *pro ratâ* grant to such Societies as arrange for and carry out lectures throughout the year in strict conformity with the following conditions and to the satisfaction of the Department:—

No Society will be allowed subsidy on more than four lectures.

Applications must be submitted not later than 1st March, 1914, and accompanying the application must be a list of the subjects (see below) which the Society chooses. The dates of lectures will then be fixed by the Department, and if Societies will state the most suitable seasons for their districts the lectures will, as far as possible, be arranged accordingly.

An attendance of at least fifteen *bonâ fide* farmers, farmers' sons or farm hands will be required, otherwise the lecture will not count for the special subsidy. In case of failure to secure such attendance another lecture will not be substituted, nor will any subsequent lectures that may have been arranged be given.

The President or Secretary or a member of the Council or Committee of the Society must take the chair at each lecture, and must certify as to the number and *bona fides* of the attendance as above required.

The rent of the hall, advertising, and all other local charges are to be paid by the Agricultural Society; all other expenses by the Department.

The Department will recognise any suitable lecture, paper, or address that a Society may arrange to have delivered by any person other than a Departmental officer, and the special subsidy of £1 5s. will be allowed for each such lecture, provided due notification prior to

delivery of lecture is given, and the President of the Society afterwards certifies as to *bona fides* and suitability of the lecture and the number and character of the attendance.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Special crops and catch crops.
7. Irrigation principles and methods.
8. Factors in successful wheat cultivation.
9. Results of experimental work, season 1913.

Veterinary Science and Live Stock Subjects.

1. The structure and care of the horse's foot (lantern).
2. Brood mares and breeding mishaps (lantern).
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Contagious diseases of stock—abortion, blackleg, tuberculosis, *anthrax, pleuro pneumonia, &c. (lantern).*
6. Ailments of swine, or ailments of sheep.
7. Unsoundness in horses (lantern).
8. Principles of stock breeding stud horses (lantern).
9. Teeth of the horse—age, defects (lantern).
10. Injuries to farm animals—first aid.

Dairy Farming.

1. Breeding and management.
2. Dairy buildings—silos and silage.
3. Dairy management.
4. Milk and cream testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.
7. Cheese making.

Apiculture.

1. The honey industry—handling bees.
2. Breeding and management.
3. Diseases of bees—methods of control.

Poultry Breeding and Management.

1. Incubation—natural and artificial—the rearing of chickens.
2. Breeds: payable or otherwise, table and export, eggs—how to select stock.
3. Turkeys: their care and management. Duck raising and care.
4. Foods and feeding, with practical demonstration—mixing the mash.
5. Common ailments of poultry.

Orchard and Garden Work.

1. Fruit growing—Varieties suitable to the different localities, soils and sites.
2. Preparation of land—Planting and pruning.
3. Cultivation—Manuring and management.
4. Insect pests and fungus diseases and their treatment.

The Fruit Industry.

1. Handling, packing, grading, and marketing of fruit for export and local trade.

Viticulture.

1. Establishment of vineyard.
2. Phylloxera and resistant stocks—Preparation of land.
3. Propagation and grafting—Best varieties to grow.
4. Pruning and seasonable operations.
5. Wine-making and cellar management.
6. Drying raisins, sultanas, and currants—Packing fresh grapes for export.
7. Vine diseases and treatment.

Subjects and Staff.

Principles of Agriculture—Mr. A. E. V. Richardson, M.A., B.Sc.; Mr. Temple Smith.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Messrs. W. A. N. Robertson, B.V.Sc.; E. A. Kendall, B.V.Sc.; R. Griffin, M.R.C.V.S.; R. N. Johnstone, B.V.Sc.; G. G. Heslop, B.V.Sc.; R. J. de C. Talbot, L.V.S.

Dairy Farming—Mr. R. T. Archer and staff of Dairy Supervisors.

The Dairying Industry and Export Trade—Messrs. R. Crowe and P. J. Carroll.

Orchard and Garden Work—Messrs. P. J. Carmody, H. W. Davey, and E. E. Pescott.

Sheep Breeding and Management—

Viticulture—Mr. F. de Castella.

Flax Culture and Demonstrations at Shows—Mr. J. E. Robilliard.

Poultry Breeding and Management—Mr. A. V. Rintoul.

Poultry Dressing Demonstrations—Mr. A. Hart.

Potato Culture—Mr. J. T. Ramsay.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. R. T. Archer.

Fruit Industries—Mr. J. G. Turner and staff.

Insect Pests—Mr. C. French, Junr.

Plant Diseases—Mr. W. Laidlaw, B.Sc., and Mr. C. C. Brittlebank.

Irrigation—Expert of State Rivers and Water Supply Commission.

Apiculture—Mr. F. R. Beuhne.

Cheese Industry—Mr. G. C. Sawers.

S. S. CAMERON,

Director of Agriculture.

Artificial Manure from Peat—

A cheap method of obtaining organic artificial manure was described by Professor W. A. Bottomley to the Agricultural Section of the British Association. The title of his paper being "The Effect of Soluble Humates on Nitrogen Fixation and Plant Growth."

Ordinary moss litter or peat is treated with bacteria—an organic manure is thus obtained, a ton of which is claimed to be worth more than 80 tons of farmyard manure.

Experiments made with this manure upon plants demonstrated a remarkable effect upon plant growth—a plot of radishes watered once with an extract of the prepared peat gave an increase of 54 per cent. over an untreated plot.

One of Professor Bottomley's points is that ordinary organic manure will become scarcer with the general use of motors, and peat may become a marketable substitute.—*Chemical World*, November, 1913.

There are many deposits of peat in Victoria.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Communicated by Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Chairman, and C. S. Sutton, M.B., Ch.B., Secretary of the Plant Names Committee of the Victorian Field Naturalists' Club.

Continued from page 572, Vol. X. (10th September, 1912).

Botanical Name.	Popular Name.	Use or Character.
DICOTYLEDONEÆ—CHORIPETALEÆ HYPOGYNÆ—*continued.*		
CHENOPODIACEÆ.		
Hemichroa—		
pentandra, R.Br. ..	Trailing Jointweed ..	No known economic value.
diandra, R.Br. ..	Shrubby Jointweed ..	
Atriplex—	Salt Bush	Most of these plants are excellent for forage, but nearly all are liable to be eaten out by overstocking. Some may be used for culinary purposes.
Billardieri, Hook. f. ..	Glistening Saltbush ..	Of slight fodder value.
*leptocarpum, F.v.M. ..	Slender-fruited Saltbush ..	All stock, particularly sheep, are fond of it.
limbata, Benth. ..	Spreading Saltbush ..	One of the most valuable of saltbushes. All stock like it.
Muelleri, Benth. ..	Lagoon Saltbush ..	Cattle and sheep are very fond of this species.
*semibaccata, R.Br. ..	Berry Saltbush	Very productive and drought resisting. One of the best and much relished by sheep.
prostrata, R.Br. ..	Creeping Saltbush ..	Of lesser fodder value.
*angulata, Benth. ..	Angular Saltbush ..	Very drought resisting and hence useful in dry districts.
stipitata, Benth. ..	Kidney Saltbush ..	
paludosa, R.Br. ..	Marsh Saltbush ..	Of limited fodder value.
cinerea, Poiret.	Grey Saltbush	A capital forage plant for cattle, and eaten with avidity.
rhagodioides, F.v.M. ..	Silver Saltbush	Stock are remarkably fond of and thrive well on this.
*nummularia, Lindl. ..	Oldman Saltbush ..	One of the tallest, most fattening, and wholesome; said to prevent fluke and to enable stock to recover from the disease.
*vesicaria, Heward ..	Bladder Saltbush ..	Very resistant to drought, very fattening. Splendid wool produced in districts where this and the following species almost monopolize the ground. This plant is avoided by horses.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	DICOTYLEDONEÆ—CHORIPETALEÆ HYPOGYNÆ—*continued.*	
CHENOPODIACEÆ—*continued.*		
*halimoides, Lindl. ..	Dwarf Saltbush ..	Dwarf. One of the best for pasture; said to prevent fluke. The alkaline salt obtained from it has been used in making soap.
spongiosum, F.v.M. .	Spongy Saltbush ..	Particularly nutritive and valuable for sheep pasture.
Rhagodia—		
Billardieri, R.Br. ..	Coastal Saltbush ..	Browsed on by stock.
parabolica, R.Br. ..	Mealy Saltbush ..	A useful forage plant, more readily eaten by cattle than by sheep.
Gaudichaudiana, Moquin ..	Cottony Saltbush ..	No special economic value.
crassifolia, R.Br. .	Fleshy Saltbush ..	
spinescens, R.Br. ..	Thorny Saltbush ..	
*hastata, R.Br.	Saloop Saltbush ..	Both are excellent forage plants for all kinds of herbivora.
nutans, R.Br.	Nodding Saltbush .	
Chenopodium— ..	.. .. ..	The young shoots of many species are used as potherbs in some countries.
nitrariaceum, F.v.M. ..	Branching Goosefoot ..	Is liked by all stock, particularly sheep.
album, L. . ..	Fathen .. .	Cosmopolitan weeds with a slight fodder value.
murale, L.	Nettle-leaved Goosefoot ..	
auricomum, Lindl. ..	Golden Goosefoot ..	A tall perennial, yielding a nutritious and palatable spinach. Useful for stock
microphyllum, F.v.M. .	Small-leaved Goosefoot ..	An excellent fodder plant for sheep
glaucum, L.	Pale Goosefoot	A cosmopolitan weed with a slight fodder value.
atriplicinum, F.v.M. ..	Purple Goosefoot ..	A capital forage plant, eaten with avidity by all herbivora.
cristatum, F.v.M. .	Crested Goosefoot .	No known economic value.
carinatum, R.Br. .	Keeled Goosefoot ..	When young, eaten by sheep, but refused by cattle and horses. Has an unpleasant smell.
Dysphania—		
littoralis, R.Br ..	Pigweed	No known economic value.
Kochia—		
lanosa, Lindley	Woolly Bluebush ..	All the species of *Kochia* are more or less drought resistant and afford a certain amount of fodder in times of drought. They are less easily eaten out than *Atriplex*, but all being more or less woolly are objectionable for continued grazing. The most valuable species are perhaps *K. brevifolia* and *K. pyramidata*, and in New South Wales *K. sedifolia* is often regarded as poisonous, owing to its forming matted balls in the stomachs of sheep grazing continuously upon it.
triptera, Benth. ..	Three-winged Bluebush ..	
oppositifolia, F.v.M ..	Five-winged Bluebush ..	
brevifolia, R.Br. ..	Short-leaved Bluebush .	
pyramidata, Benth. ..	Shrubby Bluebush ..	
aphylla, R.Br.	Leafless Bluebush .	
villosa, Lindley ..	Silky Bluebush	
sedifolia, F.v.M. ..	Dense Bluebush ..	
humillima, F.v.M ..	Dwarf Bluebush ..	
microphylla, F.v.M. ..	Small-leaved Bluebush ..	
ciliata, F.v.M.	Hairy Bluebush.. ..	
brachyptera, F.v.M. ..	Wingless Bluebush ..	
stelligera, F.v.M. .	Starred Bluebush ..	
Bassia—		
tricornis, F.v.M. ..	Three-cornered Saltbush .	Drought resistant plants, affording a little forage when feed is scarce in dry seasons and especially for sheep. Not in the first rank as fodder plants. The least useful species is *B. bicornis.*
sclerolaenoides, F.v.M. ..	Woolly-fruited Saltbush ..	
diacantha, F.v.M. ..	Two-spined Saltbush ..	
bicornis, F.v.M. ..	Two-horned Saltbush ..	
biflora, F.v.M. ..	Twin-flowered Saltbush ..	
paradoxa, F.v.M. ..	Curious Saltbush ..	
quinquecuspis, F.v.M. ..	Spear-fruited Saltbush ..	
divaricata, F.v.M. ..	Spreading Saltbush ..	
echinopsila, F.v.M. ..	Prickly-fruited Saltbush ..	
enchylaenoides, F.v.M. ..	Cushion Saltbush ..	
Threlkeldia—		
diffusa, R.Br.	Wallaby Saltbush ..	No special economic value.
salsuginosa, Benth. ..	Juicy Saltbush	
Enchylaena—		
tomentosa, R.Br. ..	Ruby Saltbush	An excellent forage plant, especially for sheep.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

Vernacular Names of Victorian Plants—continued.

Botanical Name.	Popular Name.	Use or Character.
Dicotyledoneæ—Choripetaleæ Hypogynæ—continued.		
Chenopodiaceæ—continued.		
Pachycornia—		
robusta, Hook. f.	Desert Glasswort	Sand or strand plants, but otherwise of no special economic value.
Salicornia—		
arbuscula, R.Br.	Shrubby Glasswort	
australis, Solander	Sea Glasswort	
Suaeda—		
maritima, Dumort	Seablite	
Salsola—		
Kali, L.	Prickly Saltwort	
Aizoaceæ.		
Mesembryanthemum—		
aequilaterale, Haworth	Angular Pigface	Sheep are fond of this plant, and all three species are useful for covering bare slopes, loose sand, rockeries, &c.
australe, Solander	Rounded Pigface	
tegens, F.v.M.	Small Pigface	
Tetragonia—		
expansa, Murray	New Zealand Spinach	A valuable pasture plant, especially for sheep. Useful as a culinary vegetable.
implexicoma, Hook. f.	Bower Spinach	Like the preceding, and has value as a spinach plant.
Aizoon—		
zygophylloides, F.v.M.	Aizoon	Of no known economic value.
Gunnia—		
septifraga, F.v.M.	Eastern Gunnia	
Mollugo—		
hirta, Thunb.	Hairy Carpetweed	
Spergula, L.	Curled Carpetweed	
Cerviana, Sériuge	Smooth Carpetweed	
Polygonaceæ.		
Emex—		
australis, Steinh.	Spiny Emex	Has a slight fodder value when young, but objectionable on account of its spiny fruits when older.
Rumex—		
Brownii, Campd.	Swamp Dock	All are troublesome weeds, especially in cultivated ground or on acid soils. Liming and pigs help to keep down certain species, and sheep will graze to some extent on the introduced species of *Rumex*. (Sheep sorrel).
flexuosus, Soland.	Twisted Dock	
crystallinus, Lange	Glistening Dock	
bidens, R.Br.	Mud Dock	
Polygonum—		
plebejum, R.Br.	Small Knotweed	Used for tanning purposes in the United States of America.
strigosum, R.Br.	Spotted Knotweed	Have a slight fodder value, but generally classed as useless weeds. *P. hydropiper* has a strong biting taste. All are objectionable weeds in cultivated ground.
prostratum, R.Br.	Trailing Knotweed	
hydropiper, L.	Pepper Knotweed	
minus, Hudson	Slender Knotweed	
subsessile, R.Br.	Hairy Knotweed	
lapathifolium, L.	Pale Knotweed	
Muehlenbeckia—		
adpressa, Meiss.	Climbing Lignum	No known economic value.
axillaris, Walp.	Matted Lignum	
stenophylla, F.v.M.	Erect Lignum	
Cunninghamii, F.v.M.	Tangled Lignum	
Phytolaccaceæ.		
Didymotheca—		
thesioides, Hook. f.	Bindi-Bindi	No special economic value.
Gyrostemon—		
cyclotheca, Benth.	Wheel-fruit	
Codonocarpus—		
cotinifolius, F.v.M.	Bell-fruit	
Nyctaginеæ.		
Boerhaavia—		
diffusa, L.	Tahvine	Has a certain fodder value as a stand-by especially in time of drought.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	CHORIPETALEÆ PERIGYNÆ.	
THYMELEACEÆ.		
Pimelea—		
alpina, F.v.M.	Alpine Riceflower	No special economic value.
Treyvaudi, F.v.M.	Grey Riceflower	
glauca, R.Br	Smooth Riceflower	
collina, R.Br.	Mountain Riceflower	
spathulata, Labill.	Spoon Riceflower	
linifolia, Smith	Slender Riceflower	
ligustrina, Labill.	Tall Riceflower	Perhaps the most handsome member of the genus and well worth cultivation in gardens.
humilis, R.Br	Dwarf Riceflower	No special economic value.
drupacea, Labill.	Bird cherry Riceflower	
simplex, F.v.M.	Annual Riceflower	Is considered poisonous by some, but no certain evidence is available.
trichostachya, Lindl.	Spiked Riceflower	No known economic value.
axiflora, F.v.M.	Tough Riceflower	The bark of all the pimeleas is tough but in this species it is particularly so. Sometimes blossoms the whole length of stem and branches, producing a charming effect.
microcephala, R.Br.	Small-headed Riceflower	No known economic value.
pauciflora, R.Br.	Scanty-flowered Riceflower	Is said to have poisoned stock, but has not been experimentally tested.
elachanta, F.v.M.	Coast Riceflower	No special economic value, but P. octophylla is worthy of garden cultivation.
serpillifolia, R.Br.	Thyme Riceflower	
flava, R.Br.	Yellow Riceflower	
curviflora, R.Br.	Curved Riceflower	
octophylla, R.Br.	Downy Riceflower	
phylicoides, Meiss.	Hairy Riceflower	
stricta, Meissner	Erect Riceflower	
Drapetes—		
tasmanica, Hook. f.	Mountain Drapetes	Of no known economic value.
LEGUMINOSÆ (Papilionatæ).		
Oxylobium—		
ellipticum, R.Br.	Golden Shaggy pea	No special economic value known, but several species are worthy of cultivation in gardens.
alpestre, F.v.M.	Mountain Shaggy-pea	
procumbens, F.v.M.	Trailing Shaggy pea	
trilobatum, F.v.M.	Prickly Shaggy pea	
Mirbelia—		
oxylodioides, F.v.M.	Mountain Mirbelia	
Gompholobium—		
latifolium, Smith	Broad Wedge-pea	
Huegelii, Benth.	Pale Wedge-pea	
minus, Smith	Dwarf Wedge-pea	
Jacksonia—		
Clarkei, F.v.M.	Brown Pea	
Sphaerolobium—		
vimineum, Smith	Leafless Globe-pea	
daviesioides, Turcz	Prickly Globe-pea	
Viminaria—		
denudata, Smith	Golden Spray	A handsome plant when in flower.
Daviesia—		
Wyattiana, Bailey	Long-leaved Bitter-pea	No known economic value, but several species are worthy of garden culture.
latifolia, R.Br.	Broad-leaved Bitter-pea	
corymbosa, Smith	Narrow-leaved Bitter-pea	
ulicina, Smith	Gorse Bitter-pea	
genistifolia, Cunning	Broom Bitter-pea	
brevifolia, Lindley	Leafless Bitter-pea	
pectinata, Lindl.	Thorny Bitter pea	
Aotus—		
villosa, Smith	Hairy Aotus	
Phyllota—		
pleurandroides, F.v.M	Phyllota	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Leguminosæ (Papilionatæ)—*continued.*		
Pultenaea—		
daphnoides	Long-leaved Bush-pea ..	This genus includes many handsome species, and owing to the characteristic massing of the flowers in heads, it should afford good material for the production by breeding of new decorative additions to the list of garden flowers. Among the most promising species are *P. daphnoides*, *P. villosa*, *P. mollis*, *P. rosea*, *P. Gunnii*, *P. Weindorferi*, *P. paleacea* and *P. foliolosa*.
stricta, Sims	Rigid Bush-pea ..	
retusa, Smith	Blunt Bush-pea ..	
Benthamii, F.v.M. ..	Grampian Bush-pea .	
mucronata, F.v.M. ..	*Pointed Bush-pea* ..	
paleacea, Willd... ..	Chaffy Bush-pea .	
†Williamsoni, Maiden ..	Straggling Bush-pea .	
†Gunnii, Benth.	Golden Bush-pea ..	
scabra, R.Br.	Rough Bush-pea ..	
pedunculata, Hook. .	Trailing Bush-pea ..	
tenella, Benth. .. .	Delicate Bush-pea ..	
Luehmanni, Maiden ..	Thready Bush-pea ..	
ternata, F.v.M. ..	Grey Bush-pea	
styphelioides, Cunning. ..	Heathy Bush-pea ..	
subumbellata, Hook. .	Wiry Bush-pea	
dentata, Labill. .	Clustered Bush-pea ..	
viscosa, R.Br.	Sticky Bush-pea ..	
hibbertioides, Hook. f. ..	Hibbertia Bush-pea ..	
rosea, F.v.M. .. .	Rosy Bush-pea .. .	
mollis, *Lindl.* .. .	*Soft Bush-pea*	
juniperina, Labill. ..	Prickly Bush-pea ..	
humilis, Benth. ..	Dwarf Bush-pea ..	
parviflora, Sieber ..	Small Bush-pea .	
laxiflora, Benth. ..	Spreading Bush-pea ..	
largiflorens, F.v.M. ..	Twiggy Bush-pea ..	
Weindorferi, Reader ..	Swamp Bush-pea ..	
villosa, Willd.	Hairy Bush-pea .. .	
foliolosa, Cunning. .	Leafy Bush-pea ..	
flexilis, Smith	Tall Bush-pea	
densifolia, F.v.M. .	Dense Bush-pea .	
Vrolandi, Maiden ..	Strathbogie bush-pea ..	
villifera, Sieber	Downy Bush-pea ..	
Muelleri, Benth. ..	Fragrant Bush-pea ..	
prostrata, Benth. ..	Silky Bush-pea ..	
canaliculata, F.v.M. ..	Velvet Bush-pea ..	
fasciculata, Benth. ..	Tufted Bush-pea ..	
tenuifolia, R.Br. .	Slender Bush-pea ..	
Eutaxia—		
empetrifolia, Schlech. ..	Eutaxia ..	No known economic value, but several species should repay garden cultivation.
Dillwynia—		
hispida, Lindl.	Hairy Parrot-pea ..	
ericifolia, Smith	Heathy Parrot-pea .	
floribunda, Smith .	Crowded Parrot-pea ..	
juniperina, Sieber ..	Prickly Parrot-pea ..	
cinerascens, R.Br. .	Grey Parrot-pea .	
patula, F.v.M.	Silky Parrot-pea ..	
Platylobium—		
formosum, Smith ..	Handsome Flat-pea ..	
obtusangulum, Hook. ..	Common Flat-pea ..	
triangulare, R.Br. ..	Ivy Flat-pea	
alternifolium, F.v.M. ..	Round-leaved Flat-pea ..	
Bossiaea—		
cordigera, Benth. ..	Slender Bossea	
foliosa, Cunning. ..	Leafy Bossea	
cinerea, R.Br.	Grey Bossea	
prostrata, R.Br. ..	Prostrate Bossea ..	
buxifolia, *Cunn.* ..	*Box Bossea*	
microphylla, Smith ..	Spiny Bossea	
heterophylla, Vent. ..	Variable Bossea ..	
bracteosa, F.v.M. ..	Alpine Bossea	
riparia, Cunning. .	River Bossea	
ensata, Sieber	Sword Bossea	
Templetonia—		
Muelleri, Benth. ..	Leafy Templetonia ..	Suspected poison plants, but no poisonous principle has been extracted and no conclusive experimental evidence has been obtained.
egena, Benth.	Round Templetonia ..	
sulcata, Benth.	Flat Templetonia ..	

† These species of Pultenaea may all be reducible to varieties of *P. stricta* Sims.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	CHORIPETALEÆ PERIGYNÆ—*continued.*	
LEGUMINOSÆ (Papilionata)—*continued.*		
Hovea—		
heterophylla, Cunn. ..	Variable Hovea ..	Worthy of garden cultivation.
longifolia, R.Br. ..	Long-leaved Hovea ..	
Goodia—		
*lotifolia, Salisb. ..	Golden Goodia	Has been suspected of having poisonous properties, but on incorrect evidence. Both forms have a certain fodder value.
var. medicaginea, F.v.M. ..	Smaller Goodia	
Trigonella—		
suavissima, Lindl. ..	Sweet Fenugreek ..	This perennial fragrant clover-like plant stands drought well, is a good pasture herb, and might be turned into hay or ensilage when luxuriant. Has been used as a vegetable.
Lotus—		
corniculatus, L. ..	Birdsfoot Trefoil ..	A useful pasture plant.
australis, Andrews ..	Austral Trefoil	Supposed to have properties hurtful to stock, but there is no evidence to support this.
Psoralea—		
eriantha, Benth. ..	Woolly Scurf-pea ..	No known economic value.
patens, Lindl. .. .	Spreading Scurf-pea ..	
parva, F.v.M.	Small Scurf-pea ..	
tenax, Lindl.	Tough Scurf-pea ..	
adscendens, F.v.M. ..	Black Scurf-pea	
Indigofera—		
australis, Willd.	Austral Indigo	Stock are said to have been poisoned by eating this plant.
Swainsona—		
*Greyana, Lindl. ..	Pink Swainsona	In New South Wales this is suspected of poisonous properties.
phacoides, Benth ..	Dwarf Swainsona ..	A good forage plant for sheep when taken along with other fodder, but liable to blow them if eaten too freely.
oncinotropis, F.v.M. ..	Small-flowered Swainsona	No special economic value.
plagiotropis, F.v.M. .	[illegible]ed Swainsona	
procumbens, F.v.M. ..	Trailing Swainsona ..	This plant has been proclaimed as noxious in South Australia, but is stated by Mr. Frederick Turner to be an excellent forage plant when taken with other fodder.
phacifolia, F.v.M. ..	Grey Swainsona	[Certain species and possibly all of *Swainsona* act as slow cumulative poisons, but if not grazed for more than a week or two at a time or if taken with plenty of other fodder, they serve to afford nutritious feed.]
lessertiifolia, D.C. ..	Purple Swainsona	
tephrotrica, F.v.M ..	Hairy Swainsona	
monticola, Cunn. ..	Mountain Swainsona	
microphylla, A. Gray ..	Small-leaved Swainsona	
laxa, R.Br.	Straggling Swainsona	
Glycyrrhiza—		
psoraleoides, Benth. ..	Southern Liquorice ..	No economic value known at present.
Desmodium—		
brachypodum, A. Gray ..	Robust Tictrefoil ..	
varians, Endl.	Varying Tictrefoil ..	
Lespedeza—		
cuneata, G. Don. ..	Bush Clover	Has a slight fodder value when young.
Glycine—		
clandestina, Wendl. ..	Twining Glycine ..	Worthy of cultivation as garden plants.
Latrobeana, Benth. ..	Purple Glycine	
tabacina, Benth. ..	Variable Glycine ..	
sericea, Benth. .. .	Silky Glycine	
Kennedya—		
*rubicunda, Vent. ..	Dusky Coral-pea ..	Ornamental plants worthy of cultivation in our gardens.
prostrata, R.Br.	Scarlet Coral-pea ..	
Hardenbergia—		
*monophylla, Benth. ..	Purple Coral-pea ..	One of the best known and most beautiful climbing plants we have.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Leguminosæ (Caesalpinoideæ).		
Cassia—		
australis, Sims	Southern Cassia	Often grown in gardens.
phyllodinea, R.Br.	Leafless Cassia	Stock eat this greedily, even when other feed is plentiful.
eremophila, Cunn.	Desert Cassia	In time of scarcity, an excellent stand-by for stock, especially sheep. A charming shrub for gardens.
artemisioides, Gaudich.	Wormwood Cassia	A shrub adapted for dry districts. Affords feed for sheep. A beautiful shrub.
Sturtii, R.Br.	Dense Cassia	No known economic value.
desolata, F.v.M.	Rock Cassia	In drought time affords herbage for stock. Well worth cultivating in gardens. It is better to grow any Cassia than none at all, and many would adorn any garden.
Leguminosæ (Mimosoideæ).		
Acacia, Continuæ—		
continua, Benth.	Thorn Acacia	
Acacia, Pungentes—		
spinescens, Benth.	Spiny Acacia	Specific gravity of wood, 1,010.
lanigera, Cunn.	Woolly Acacia	
colletioides, Cunn.	Furze Acacia	
siculiformis, Cunn.	Sickle Acacia	
juniperina, Willd.	Juniper Acacia	Of no special economic value.
tenuifolia, F.v.M.	Thin-leaved Acacia	
diffusa, Edwards	Spreading Acacia	
rupicola, F.v.M.	Rock Acacia	
Acacia, Calamiformes—		
rigens, Cunn.	Wallaby Acacia or Nealia	An ornamental shrub. Wood useful for tool handles.
calamifolia, Sweet	Reed-leaved Acacia	No known economic value.
Acacia, Uninerves—		
aspera, Lindl.	Rough Acacia	
*armata, R.Br.	Hedge Acacia	Extensively used for hedge purposes. Proclaimed under Thistle Act for eight shires in this State.
vomeriformis, Cunn.	Ploughshare Acacia	
acanthoclada, F.v.M.	Harrow Acacia	
obliqua, Cunn.	Spoon Acacia	
glandulicarpa, Reader.	Hairypod Acacia	Of no special economic value.
acinacea, Lindl.	Gold Dust Acacia	
lineata, Cunn.	Streaked Acacia	
microcarpa, F.v.M.	Small Pod Acacia	
montana, Benth.	Mountain Acacia	A handsome species well worth cultivation.
verniciflua, Cunn.	Varnish Acacia	No known economic value.
leprosa, Sieber.	Leper Acacia	
*stricta, Willd.	Straight-leaved Acacia	
Sentis, F.v.M.	Bramble Acacia	Resists protracted drought. Stock readily browse on the foliage.
*penninervis, Sieber	Hickory Wattle	Bark valuable for tanning, producing a soft and pale leather. Wood excellent for axe and tool handles generally. A handsome tree.
var. falciformis	Golden Hickory Wattle	
retinodes, Schlech.	Wirilda	Bark useful for tanning. A beautiful species.
*pycnantha, Benth.	Golden Wattle	Bark second only to that of *A. decurrens* and *A. mollissima* in tanning strength.
*obtusata, Sieber.	Sword Acacia	Of no special economic value.
amoena, Wendl.	Boomerang Acacia	
hakeoides, Cunn.	Hakea Acacia	
salicina, Lindl.	Willow Acacia	Leaves eaten by stock. Bark useful for tanning. Timber used for making furniture.
*suaveolens, Willd.	Sweet Acacia	A shrub worthy of cultivation in gardens.
*linifolia, Willd.	Flax Acacia	No known economic value.
*lunata, Sieber.	Crescent Acacia	Both lovely shrubs, well worth cultivation in gardens.
brachybotrya, Benth.	Silvery Acacia	
vestita, Edwards.	Hairy Acacia	No known economic value.
pravissima, F.v.M.	Ovens Acacia	A very beautiful shrub.
*myrtifolia, Willd.	Myrtle Acacia	A small species bearing flowers of a rich orange yellow.

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Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Leguminosæ (Mimosoideæ)—*continued.*		
Acacia, Plurinerves—		
trineura, F.v.M. ..	Three-nerved Acacia ..	Of no special economic value.
elongata, Sieber. .	Long-pod Acacia ..	
subporosa, F.v.M.	River Acacia	Wood tough and elastic, fit for carriage shafts, gunstocks, and various select tools.
Howittii, F.v.M. ..	Sticky Acacia	No special economic value known.
homalophylla, Cunn. ..	Yarran Acacia	Wood dark-brown, fragrant, and much used for turners' work. Furnishes good forage in drought time.
Osswaldi, F.v.M. ..	Umbrella Acacia ..	Foliage browsed on by stock.
stenophylla, Cunn. ..	Eumong Acacia ..	A tree with exquisite hard dark wood.
sclerophylla, Lindl. ..	Hard-leaved Acacia ..	Of no special economic value.
farinosa, Lindl.	Mealy Acacia	
*melanoxylon, R.Br ..	Blackwood	Furnishes one of our most valuable woods.
*implexa, Benth. .	Lightwood	Wood strong and tenacious, and useful for many purposes. Bark useful for tanning.
Acacia, Juliferæ—		
Oxycedrus, Sieber. .	Spike Acacia	Of no special economic value.
verticillata, Willd. .	Prickly Acacia	
subtilinervis, F.v.M. .	Eastern Acacia	
Dallachiana, F.v.M. .	Catkin Acacia	
alpina, F.v.M.	Alpine Acacia	
*longifolia, Willd. ..	Sallow Acacia	
var. sophorae . .	Coast Acacia	Bark useful for tanning sheep skins especially.
*linearis, Sims .. .	Narrow-leaved Acacia	
aneura, F.v.M. .. .	Mulga	Foliage is good fodder in drought time. Wood hard. Might well be turned to commercial uses.
doratoxylon, Cunn. .	Carrawang . ..	Foliage eaten by stock. Timber hard, close grained, tough, and durable.
*glaucescens, Willd. ..	Rosewood Acacia ..	Wood hard, dark, prettily grained, and fragrant.
Acacia, Bipinnatæ—		
Mitchelli, Benth. ..	Fringe Wattle	Of no special economic value.
*discolor, Willd.	Sunshine Wattle ..	
*decurrens, Willd. .	Early Black Wattle ..	These trees are the most important as yielders of the best tanning bark. They are quick in growth, will live in any soil, and are easily cultivated. They give good shelter, and the wood is useful for many purposes. Seeds—which take 14 months to mature—should be soaked in hot water before sowing.
*mollissima, Willd. ..	Late Black Wattle ..	
*dealbata, Link.	Silver Wattle . ..	
Rosaceæ.		
Geum—		
urbanum, L.	Avens	The dry root contains as much as 41 per cent. of tannic acid.
Potentilla—		
anserina, L.	Silverweed	A perennial weed, of no known economic value.
Rubus—		
parvifolius, L. .. .	Small-leaved Bramble ..	Of slight economic value, and bearing edible fruits.
rosifolius, Smith ..	Rose-leaved Bramble ..	
Moluccanus, L.	Moluccan Bramble ..	
Alchemilla—		
vulgaris, L. .. .	Lady's Mantle	No economic value.
Acaena—		
ovina, Cunn.	Sheep's-burr	Both troublesome weeds, the burr-like dry fruits becoming tangled in the wool of sheep.
sanguisorbae, Vahl. ..	Bidgee-widgee	

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

Vernacular Names of Victorian Plants—*continued.*

Botanical Name	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Saxifragaceæ.		
Aphanopetalum—		
*resinosum, Endl. ..	Gum Vine	A hardy evergreen climber.
Eucryphia—		
Moorei, F.v.M.	Pinkwood	Affords a timber with close, tough grain tough, but cutting well, and much liked by coachbuilders.
Bauera—		
rubioides, Andrews ..	Wiry Bauera	A handsome plant, well worth cultivating in gardens.
sessiliflora, F.v.M. ..	Showy Bauera	A very beautiful plant, but not listed in any of our florist's catalogues.
Crassulaceæ.		
†*Tillaea*—		
Sieberiana, Schultz ..	Austral Stonecrop ..	Insignificant herbs of no importance.
purpurata, Hook. f. ..	Purple Stonecrop ..	
exserta, Reader ..	*Large-fruited Stonecrop* ..	
macrantha, Hook. f. ..	Long-flowered Stonecrop ..	
pedicellosa, F.v.M. ..	Stalked Stonecrop ..	
recurva, Hook. f. ..	Swamp Stonecrop ..	
Onagraceæ.		
Epilobium—		
confertifolium, Hook. f. ..	Alpine Willowherb ..	Of no known economic value.
pallidiflorum, Sol. ..	Pale Willowherb ..	
glabellum, Forster ..	Smooth Willowherb ..	
junceum, Forst. ..	*Hairy Willowherb* ..	
Jussieua—		
repens, L.	Clove Strip	
Lythraceæ.		
Ammania—		
multiflora, Roxb. ..	Jerry-jerry	Of no known economic value.
Lythrum—		
Salicaria, L.	Purple Loosestrife ..	
Hyssopifolia, L. ..	Small Loosestrife ..	
Halorageæ.		
Loudonia—		
Behrii, Schlech. ..	Golden Pennants ..	An attractive Mallee plant worth cultivating.
Haloragis—		
elata, Cunning.	Tall Raspwort	Useless weeds; of no known economic value.
Meziana, Schindler ..	Hairy Raspwort ..	
rubra, Schindler ..	Red Raspwort	
tetragyna, (Lab.) Hook. f.	Poverty Raspwort ..	
teucrioides, Schlech. ..	Germander Raspwort ..	
micrantha, R.Br. ..	Small-flowered Raspwort ..	
depressa, Walpers. ..	Flat Raspwort	
glauca, Lindl.	Grey Raspwort	
heterophylla, Brong. ..	*Irregular Raspwort* ..	
var. aspera	Rough Raspwort ..	
exalata, F.v.M.	Winged Raspwort ..	
digyna, Lab.	*Prickly Raspwort* ..	
Brownii (Hook.f.) Schindler	Creeping Raspwort ..	
odontocarpa, F.v.M. ..	Toothed Raspwort ..	
monosperma, F.v.M. ..	One-seeded Raspwort ..	
racemosa, Lab	Shrubby Raspwort ..	
var. Bauerlenii, F.v.M.		

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VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	CHORIPETALEÆ PERIGYNÆ—*continued.*	
HALORAGACEÆ—*continued.*		
Myriophyllum—		
pedunculatum, Hook. f. ..	Red Water Milfoil ..	Water weeds of no known economic value
amphibium, Labill. ..	Submerged Water Milfoil	
propinquum, Cunn. ..	Stout Water Milfoil ..	
verrucosum, Lindl. ..	Rough Water Milfoil ..	
elatinoides, Gaudich. ..	Coarse Water Milfoil ..	
Muelleri, Sonder. ..	Slender Water Milfoil ..	
integrifolium, Hook. f. ..	Small Water Milfoil ..	
CALLITRICHACEÆ.		
Callitriche—		
verna, L.	.. .. ..	Water weeds of no special economic value
Muelleri, Sonder. ..	.. .. ..	

Potatoes as a Food for Pigs—

From Germany comes an account of experiments that should be of interest to agriculturists at this time. They demonstrate the possibility of profit from swine husbandry. These experiments were designed to test the value of potatoes as compared with maize in the principal food in the rations fed to pigs. Forty-three, twelve-weeks old, and weighing about 44 lbs., were put up for five months to fatten. They were given a fixed basal ration, which on the average amounted to a little over 2 lbs. grain meal and 3 ozs. of fish meal per head per day. In addition to this, one lot got slightly over 2 lbs. maize meal, while another got between 9 and 10 lbs. potatoes. Both lots made good progress, producing on the average about 1 lb. of pork daily and 1 lb. live weight increase for about 4 lbs. meal. The interesting point, however, is the profit. The maize was valued at £8 8s. per ton. The potatoes were charged at 33s. 6d. and the grain, or pease meal, cost £9 6s. 8d., while the fish meal was 1s. 4d. per lb. The value of the live-weight increase was reckoned to be 5.4d. per lb., or about 6¾d. per lb. of carcase. At these prices—and certainly the feeding stuffs are high and the pork low compared with current British prices—the pigs left a gross profit amounting to 27s. 11d. per head with maize and 24s. 1d. with potatoes. These results should strengthen the advocacy of those who hold that pig-keeping is undeservedly a neglected branch of agriculture in this country.—*The Farmers' Union Advocate*, Wellington, N.Z.

DAIRYING AT AIREY'S INLET.

By M. Thomas, Dairy Supervisor.

This out-of-the-way district is so surrounded by forest and Government reserves, and has been exposed to the ravages of rabbits for so many years past, that at first sight its appearance gives quite an unfavorable impression; but, in point of fact, it contains some excellent dairying lands and flats, watered with never-failing streams. Mr. John Sutherland has picked out these flats in his selection of 1,280 acres, and has started an up-to-date dairy farm on 100 acres. This place he calls "The Glen," and it is a most ideal spot for the purpose. His land has a frontage of 2 miles to the sea, and runs half-a-mile back towards Peter's Hill. These 100 acres consist of rich alluvial deposit and decomposed vegetable matter, having a sub-soil of fine loamy clay

MILKING MACHINES AT WORK.

wonderfully adapted for the growth of clover; and, in fact, all grasses. It is all wire-netted and divided into fourteen paddocks, with Airey's River running through them. Some seven years ago this rich flat was a mass of ferns and scrub and timber, and constituted a refuge for all sorts of vermin. Indeed, outside the northern boundary fence the ferns are to be seen as thick as they can stand, from 9 to 11 feet high. The clearing was heavy in patches, and cost a large amount of money. The ferns are killed in one operation by discing them to a depth of 9 to 10 inches in the rich soil. Some nine years ago this land was reported unfit for settlement, but now rye grass, strawberry and bird's-foot clover are spreading rapidly, while paspalum and phalaris grasses have a strong hold all over the flat, and are doing well; the splendid result to be seen to-day bears ample testimony to the owner's industry. A notable feature in connexion with this land is that the sole of grass thickens each year; indeed, it is owing to this fortunate circumstance

that Mr. Sutherland has been practically compelled to take up dairying, as latterly no ordinary stocking could keep the feed down; this is now accomplished by heavily stocking small paddocks in the flush of spring and cutting the surplus for silage. In this way the whole area can be utilized to the best advantage.

Fat sheep off this land have often topped the Colac market, and the cream bids fair to do the same.

The cream is classed as superfine, and, indeed, the flavours of all the products from this farm seem to be of a high grade. Milk, butter, and all fruits, asparagus, and tomatoes are especially fine. Climate has, no doubt, much to do with this, as it is so mild that frosts are rarely experienced.

The hills surrounding this flat run up to 350 feet high, some of them being volcanic. The clovers and grasses thrive well wherever sown on them, but not to such an extent as on the flats, with their 15 to 18 inches of dark loamy sand and vegetable matter, which may almost be regarded as the home of clovers. The improvements consist of a 16-stall milking

VIEW OF MILKING SHED.

shed and engine-room, built on the Echelon style, adapted to suit local requirements, all done in concrete floor and drained. The dairy is double-walled, and ventilated by underground piping. The milking is carried out by the owner and his son by means of three L.K.G. milking machines, with the attendant Felix engine, separator, and vacuum pump, and a water pump, to a well which, at 6 feet deep, turned out quite unexpectedly to be salt. This well water is found to be a good deodorant for flushing out the floors of the milking shed, as well as providing the pigs with the luxury of a saline mud bath in the hot weather. A Turnbull steamer is also installed, which heats water (by steam) in a few minutes, for at least five purposes:—1. Cleaning milking machines with boiling water. 2. Heating the washing-up water. 3. Steaming all utensils. 4. Heating the milk in winter. 5. Cooking pigs' feed. All of these operations the steamer does cheaply and quickly, as wood is plentiful, and it takes 18-inch billets of wood. The separated milk flows into a large tank outside the separator-room, where

the froth is allowed to settle; 10 to 15 per cent. of water is then added. This milk is then conveyed by 2-inch down-piping to the pigsties, some 130 yards distant. The piggeries are well constructed with concrete and brick floors; removable wooden floors are used when topping up the pigs.

PASPALUM GRASS.

The situation of the milking shed, on a knoll sloping every way with a 20-feet fall, is an ideal one from a sanitary point of view.

The first ten weeks' milking, from the middle of November, in spite of adverse conditions (there being nine weeks of constant rain), yielded over £100 in dairy produce from 32 cows, or over £3 per cow. The

cows were restricted to 25 acres, in order to keep the feed down, so this is equivalent to a return of £4 per acre for the ten weeks alone. Sixty tons of clover and grass silage were cut from 8 acres, and 40 tons of stack ensilage were made from 7 acres, and at the time of writing the feed was so rank in the flats that the silage was not likely to be required this year. A pit silo has been made in the hillside, and boarded up with hardwood. It has not been opened, so that opinion cannot be expressed about the quality of it.

The pigs have the run of 2 acres of rye grass and clover, with a fern hill of 5 acres in the bush, with bush sheds and lots of shelter. They practically live in the open, as they never enter the sties, except when being topped off. Apart from the separated milk, their chief food is grass, clover, and paspalum, to which artichokes, beet, and steamed potatoes are added as required prior to the pigs being fattened. The dairy herd consists of cows bought last year, with the Ayrshire breed predominating. They are mostly young, and in good condition. Proper records are to be kept of the milkings, and tests taken, so that later on some of them may be discarded, and better ones purchased in their stead.

No cultivation has so far been attempted to supply winter feeding for the cows; in all probability, as is the case with the Messrs. Black Brothers, of Tarwin, it will not be necessary, owing to the abundance of strawberry clover. It is hoped that some of the adjoining land will be made available for selection in the near future, for it seems a pity that such rich land should be covered with timber, which cannot be turned to profitable use for many years. This is merely a short paper, setting out what can be done by an energetic man with land regarded as unfit for settlement. Perhaps later on opportunity will be taken to write more fully on this property, when Mr. Sutherland has had time to develop it into first-rate order, milking 80 to 100 cows on "The Glen," and carrying on other branches of the farming industry.

Central Seed-testing Station—

Under the auspices of the Aberdeen College of Agriculture, Mr. W. J. Profeit recently lectured on "Farm Crops" in the Marischal College, Aberdeen.

In the course of his remarks, Mr. Profeit referred to the necessity that existed for a central station for the testing of seeds. There were several institutions in the country which carried out this kind of work, but, unfortunately, every tester was a law unto himself. There was no standard method. It would be to the interests of farmers, dealers, and others if such a station were in operation.

The Scottish Board of Agriculture was setting up one in Edinburgh, in Ireland one had been at work for some time, and England would likely get one soon. As the seed business was not confined to any particular country, the most satisfactory way would be to have a central testing station for the whole of the United Kingdom.—*Fertilizers*, 1st November, 1913.

GREASY HEELS IN HORSES.

By G. Heslop, B.V.Sc.

Grease is a term used to denote a diseased condition of the skin and subcutaneous tissues situated at the back of the fetlock joint. It is characterized by the production of vesicles and pustules, which exude a particularly evil-smelling greasy discharge, and which, as the disease progresses, brings about the formaton of numerous wart-like excrescences, commonly referred to as "grapes." This condition of "grapes" is similar to that produced in a wound where there is an excess of granulation tissue (proud flesh). The tissue has a plentiful blood supply, and if injured bleeds freely. It thus acts as an irritant, retarding healing, and assists in the continuance of the disease by forming ridges and furrows over the affected surface, in which greasy discharges accumulate. Grease can be divided into two stages.

(1) Where there is a formation of vesicles followed by pustules, which finally rupture and exude a greasy discharge.

(2) Where, in association with the first stage, there is active tissue reaction and production of excessive granulation tissue ("grapes").

The first stage is usually amenable to treatment. The second stage is very obstinate, and only responds after prolonged treatment, if at all.

The pathology of the disease has not been thoroughly worked out. A certain degree of contagiousness has for some time been recognised by bacteriologists, who have found various bacteria associated with the lesions of grease, but have not been successful in isolating any particular organism which they could claim to be the specific causal agent. From what is at present understood of the disease, it seems probable that the specific causal agent is a bacterium.

That constitutional causes play a large part in the production of the disease is undoubted, but they merely act in a predisposing or accessory manner. We know that constitutional causes are responsible for skin diseases in other situations, such diseases as mallenders and sallenders being caused in this way, and arguing by analogy it is reasonable to suppose that these same constitutional causes play some part in the production of grease.

Local irritation also acts as a predisposing cause. The disease is more common in horses kept in insanitary stables, where the accumulated manure and moisture, together with the ammonia liberated by such filth, acts as a direct skin irritant.

Frequent washing of the long loose hair situated around the pastern joints in draught horses acts as a predisposing cause in that it produces a cracked condition of the skin about the heels, and allows ready ingress for bacteria. The disease is more common in old than young horses, and particularly horses kept with lengthy periods of enforced idleness in a stable.

Draught horses are more often affected than light horses, the latter indeed being rarely troubled. This susceptibility of draught horses to the disease may be explained by the presence in draughts of the large amount of loose hair situated around the pastern joint, and the practice

of frequent washing of this hair without thorough rubbing and drying afterwards. The injurious effect of washing the legs without thorough drying afterwards has become so well recognised by veterinary surgeons that, in the treatment of grease, applications containing water are not used if they can be avoided. Horses with white pasterns are more liable to become attacked with the disease than those possessing darker-coloured ones.

Draught horses affected with pastern itch (mange, so called) and not subjected to proper treatment will very often subsequently become attacked with grease, the one disease paving the way for the production of the other.

Preventive measures should be employed in order to guard against an outbreak of the disease. Stables should be kept in a sanitary condition, well drained, and no accumulations of manure allowed under the horses' feet. Washing of the heels should not be done unless absolutely necessary, and then should be followed by thorough drying and vigorous rubbing to promote circulation in the parts. Washing with solutions of strong soaps or alkalis is particularly harmful, and should always be avoided. In order to guard against contagion, no horse should be placed in a box or stall which has become contaminated by discharges from an affected horse until floors and fittings, brushes, &c., have been thoroughly disinfected.

Treatment.—Although it has occurred, spontaneous recovery from grease is very rare, and in nearly every case some treatment will be necessary. In order to get the best results from the treatment employed it is essential that it be undertaken early, as the disease in its earlier stages is more amenable to treatment than in the later stages. The patient should be placed on a diet consisting principally of green food-stuffs, mashes, &c., and the allowance of oats and other hard food-stuffs should be reduced. Stable floors should be cleaned thoroughly of manure and stained litter, and clean bedding supplied. This should be replenished from time to time, and soiled bedding not allowed to accumulate under the horses' feet. In the early stages of the disease an application of disinfectant (lysol, carbolic acid, &c.) and methylated spirits can be employed. Ointments and grease-containing applications should be avoided in the early stages of treatment, as, unless used with proper care and control, they are likely to do more harm than good. A very good application is composed of formalin, 1 part; methylated spirits, 5 parts; and glycerine, 10 parts; this being painted on with a brush and allowed to dry in. Water applications should be avoided, and the legs should not be washed.

In older-standing cases, where there is an extensive formation of pustules and falling out of the hair, an application consisting of—

Goulard's extract	..	..	..	3 ozs.
Methylated spirits	..	..	..	½ pint
Glycerine ..	..	..	..	½ pint

can be used, painted on and allowed to dry in.

In cases where there is formation of "grapes" it is necessary to have the excess of granulation tissue removed. This can be done by applications of a hot iron, or by surgical removal with a knife or curved

scissors. This is best performed by a qualified veterinary surgeon, as *very often a very obstinate* bleeding follows the operation, and requires special measures to deal with it.

Treatment should be continued until all traces of greasy discharge have disappeared. In the final stages of the treatment, dry dressings of calomel or salicylic acid will be beneficial. Throughout the treatment the animal should have moderate daily exercise, as rest and enforced idleness favour the course of the disease.

In all cases where veterinary aid is available, it should be obtained, *as very often special cases of grease require special treatment*, which can only be carried out by a veterinary surgeon.

Internal administration of arsenic has had a beneficial effect in the treatment of this disease. Horse-owners should be guided by the advice of their veterinary surgeon regarding its employment, as very often its continued use with stallions leads to a degree of impotence or sterility.

In view of the fact that investigators have succeeded in isolating spirochetes (*small parasitic organisms*) *from the lesions of grease*, the employment, in cases where valuable horses are affected, of salvarsan ("606") and the newer preparation, neosalvarsan ("914"), might be used by the veterinary surgeon with advantage. Excepting with valuable animals, however, the expense would not be justified.

The *Arabian National Stud Book, Vol. I.*, has been published in America, and Sir Walter Gilbey has written the preface, in which he states that up to the present time more than 4,000 distinct works, in various languages, have been devoted to the horse, and among these are nearly ninety in Arabic and Persian, which are specially devoted to the Arab breed. The history of the horse shows that there have been two distinct types in Britain since the time of Julius Cæsar, nearly 2,000 years ago—namely, the light horse and the heavy horse. There can be no doubt whatever concerning the importance of the part which the Arab horse has played in the work of building up all our breeds of light horses. The heavy horse is a distinct type, and has been developed from the ancient British war horse, which evoked the admiration of Julius Cæsar. This breed of horse was the anxious care of Parliament from a date prior to the time of King John; and it is noted that the weight a *riding horse of this type had to bear, with its mail-clad rider and* the plate armour with which it was protected, might be upwards of 4 cwt., or 32 stone.

"Hoard's Dairyman" advises as a relief from milker's cramps for the person affected to bathe his hands in pure alcohol every evening for five or ten minutes until they cease to cramp any more.

REPORT ON NHILL FARM COMPETITIONS, 1913.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The results of the Nhill farm competitions for 1913 are herewith submitted, and the opportunity is taken of congratulating the Nhill Agricultural Society on its achievement in successfully organizing and carrying out thirteen consecutive annual farm competitions. The number of entries (54) for this year was the highest received during the whole of the period under review.

VALUE OF COMPETITIONS.

There can be no doubt that the farm competitions conducted by the society during the past thirteen years have been productive of a vast amount of good, not only to the individual competitors and to the farmers of the district, but also these competitions have had an undoubted influence on the farming practice of the wheat areas of the State.

The competitions create a spirit of emulation and friendly rivalry between the various competitors, and this spurs each to achieve the highest within his power.

If the competitions did no more than bring each competitor to critically review his farming practice and see wherein it could be improved, they would be justified; but they do more than that. The whole of the progressive farmers throughout the district watch these competitions, even though they themselves do not take part, and the merits and failings of the system of farming of the leading competitors arrest their attention and bring about an improvement in their own practices. More important still is the influence which these competitions have had on the farming practice of the wheat areas of the State.

Through the enterprise of the Nhill Society, large numbers of pamphlets, embodying the results of the competitions, have been distributed each season, and the object-lessons set by the leading farmers are available for all tillers of the soil to follow. The standard set by the best farmers of the district has had a good leavening influence on general farm practice.

CROPS AND METHODS OF CULTIVATION.

The crops inspected during the progress of the competitions were, on the whole, extremely satisfactory, and furnished a remarkable illustration of the capacity of the wheat plant to yield under adverse seasonal conditions when rational methods of tillage are practised. The autumn and winter rains were very scanty in the Nhill district, and no saturating subsoil rains were experienced. The outlook in early spring was very gloomy, but a nice fall in September, combined with the stores of subsoil moisture conserved during the previous fallowing period, enabled the crops to mature, and, in many cases, to yield well. In some cases, yields of over 40 bushels per acre may be expected. Mr. W. G. Greenwood's crop of Federation wheat at Gerang will probably exceed 40 bushels per acre over the whole farm—a very remunerative return from land valued at £7 per acre.

One only needs to inspect the fallow land of this grower to be convinced that the secret of his success is thorough preparation and cultivation of the soil.

Necessity for Efficiency in Farming.

Throughout the wheat areas of the State, remarkable differences are to be observed each year in the yield of crops growing on land of apparently identical quality. In numbers of cases, a boundary fence or a road separates a grower with a 30-bushel crop from a grower with a 10-bushel crop. Such differences are not to be reckoned as due to the quality or fertility of the soil, but to the methods of cultivation practised. These differential yields are the differential rewards for efficiency and mediocrity in farm practice.

Each year there is a tremendous loss of national wealth because many farmers are not following those practices which are acknowledged to lead to success in comparatively dry districts, such as Nhill. The factors underlying the successful cultivation of wheat are—

(1) Early fallowing; (2) thorough working and cultivation of the fallow; (3) rational manuring; (4) systematic rotation of crops; (5) careful attention to the selection of the seed, and the grading and treatment of the seed wheat.

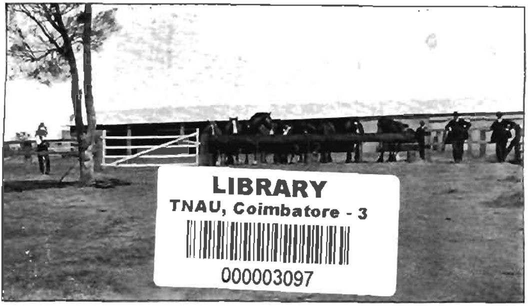

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Fig. 1.—Mr. W. Dahlenburg's Stable and Horses. First prize Small Farm.
(See page 110.)

We shall have occasion to refer to these later, but, in the meantime, it may be urged that if every farmer cultivated and worked his land like some of the competitors in this competition, the average wheat yield of the State would be vastly improved. When the *many* cultivate their land like the *few* are doing at the present time, Victorian wheat yields will improve by at least 50 per cent.

The need for increased efficiency in wheat farming is the more necessary in Victoria, in view of its comparatively dense population—*i.e.*, dense as compared with the other States—the high prices of farming land, and the limited areas available for settlement. We have no millions of acres of unallotted wheat lands available for selection, and therefore we must strive to use to the best advantage what land we have. Victoria must depend for her future progress in agriculture, not so much on the

multiplication of acreage under crop, as upon the efficiency with which each acre is cultivated: and the efforts of the Nhill and kindred agricultural societies in fostering increased efficiency in farming practice through the medium of crop and farm competitions is deserving of every encouragement.

CROP VARIETIES.

The most popular variety of wheat grown was Federation—which variety comprised the bulk of the sowings. Next in importance was Dart's Imperial—more attractive in appearance than Federation, and a good dual-purpose wheat for hay and grain. Yandilla King and Purple Straw were very widely sown, whilst lesser areas of varieties such as Viking, Bunyip, Marshall's No. 3, and hay varieties such as Huguenot, Triumph, and Baroota Wonder, were cultivated. Imported types, such as Chul, Turkey Red, Defiance, Galgalos, were also noted.

DISEASES.

Disease imposed a heavy toll on the wheat crops throughout the district. The incidence of the spring rainfall was such as to favour the development of rust, and considerable damage was done with many crops. While some of the varieties were hardly affected, others were very badly damaged. In some cases where growth was rank, the damage through this disease would probably amount to two to three bags per acre. Federation was one of the most susceptible of varieties, whilst Dart's Imperial and Yandilla King were relatively free. No doubt the later maturity of these latter and the peculiarities of the spring seasonal conditions assisted in warding off the attacks of rust.

Patches of "Take-all" were noticeable in nearly every paddock inspected, and the damage done to the district through this disease this season will approximate 10 per cent. of the total crop. One field was withdrawn from competition owing to the ravages of the pest. In view of the damage done at Nhill this season by this disease, and the many inquiries received by the Department of Agriculture from farmers in other districts regarding "Take-all," it might be explained that the peculiar patches of whiteheads visible in so many wheat crops this year are caused by the ravages of a fungus (*Ophiobolus graminis*). One characteristic of this disease is that it usually occurs in more or less circular patches throughout the crop. The spores or "seeds" of the fungus attack the young wheat plant, and may either cause it to die off at the early stages of growth ("Take-all") or just as it is approaching maturity, in which latter case only mere empty wheat ears devoid of grain (whiteheads) result.

If a typical affected plant from a "Take-all" patch be examined, and the sheath at the base be pulled away from the stem, a blackened incrustation will be observed on the stem at the junction of the stem and the roots. This blackened area is caused by the ripe spores of the fungus which has hitherto been living in the tissues of the stem and root and diverting nourishment that should go to the development of the head. The peculiarity of the fungus is that it can live, not only on the wheat plant, but also on a number of our native grasses, which latter may therefore act as host plants for the parasite. This accounts for the fact that "Take-all" often appears in the first crop taken from new or virgin land. On the other hand, the oat plant is relatively immune from attack, and can therefore be used in a rotation to check the pest.

The most effective method of eradication is to starve the fungus out by preventing the growth of any grasses on the fallows, and by interposing in the system of rotation an oat crop grown on well-prepared fallow. For example, the wheat crops that are badly affected with "Take-all" this season (1913) should be well fallowed in 1914, care being taken to suppress the native grasses which harbor the pest. The following year sow oats, which are immune from attack, and follow the oats with a clean fallow for wheat in the following year, after which the normal rotation may be pursued. In addition, avoid as far as possible working the land when dry, since dry working and a hollow seed-bed predispose a crop to "Take-all."

Besides these diseases, bunt, loose smut, and flag smut were noticeable. The damage done by the two latter is not great, but there is no excuse for the prevalence of smut in the crops, seeing that this disease may be controlled by the farmer. In a field of 90 acres at Kaniva exhi-

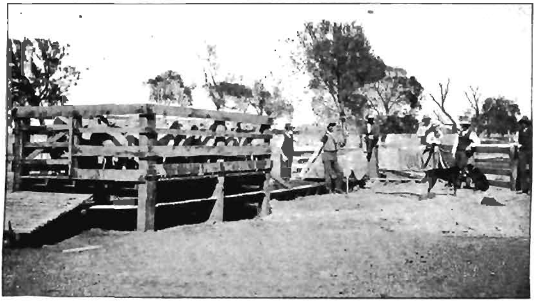


Fig. 2.—Sheep dipping on Mr. G. S. Crouch's Farm. **(See page 107.)**

bited for competition there was sufficient bunt or ball smut in an otherwise promising crop to lower its average yield by at least one to two bags per acre. The fungicides used by the different competitors for the control of bunt were bluestone, formalin, and fungusine, all of which when properly used were effective. Bluestone is the most reliable all round pickle, though, of course, it interferes with the vitality of the seed and delays germination slightly. But there was much evidence of guess work and rule of thumb in the methods of pickling, and in all such cases smut was invariably detected in the crops. Solutions of definite concentration should be used, and not arbitrary measures like a handfull of bluestone to a bag of seed, with sufficient water to wet the seed well. The more careful farmers use definite strengths, *e.g.*, 1½–2 lbs. of bluestone to 10 gallons of water, or, in the case of formalin, 1 lb. of fungicide to 45 gallons of water, and immersion to take place for 4–5 minutes. Care should always be taken, too, to avoid the use of smutty seed.

Feeding Sheep.

The wheat crops generally were well-grown, and gave promise of fine yields. Some of the fields were foul with wild oats, which will undoubtedly depress many of the yields. The prevalence of the wild oat in the Wimmera wheat crops is the price the farmer must pay for his reliance on the wild oat as his staple sheep feed. On the black soils, its eradication, even if desirable, is a matter of considerable difficulty. There are those who contend that the wild oat is practically an essential where sheep are kept, owing to the scanty nature of the ordinary Wimmera herbage. Signs are not wanting, however, that in the near future considerable changes will take place in the method of feeding sheep on the wheat farms. Hitherto it has been the practice (a practice borrowed from the traditions of Australian pastoralists) not to make any special provision for the feeding of sheep, but to let them graze on the stubbles, the fallows, and on the paddocks lying out in grass. Obviously, the number of sheep that can thus be kept on an average 640-acre wheat farm is strictly limited, and where a four-course rotation is practised the number does not exceed 200 in the Nhill district. Several enterprising farmers have taken in hand the growing of small areas of barley, rye and vetches, rape, mustard, pease, and summer crops like sorghum, with the object of feeding down these forages with sheep. In this manner they are raising the stock-carrying capacity of their farms, adding variety to the system of farming, improving the fertility of the soil, lessening the prospect of securing those fungoid pests, such as "Take-all," which are the inevitable outcome of cropping repeatedly with the one crop. It is pretty certain that the growth of special forage crops for ultimate feeding down with sheep and lambs will be the next big forward move in our system of wheat farming, especially in the more favoured wheat areas. The innovation will profoundly affect our agricultural practice, for it will mean better quality and higher prices of lambs, bigger cereal crops, and a steady increase in the fertility of the soil. It is necessary to point out, however, that the growth of these forage crops will only result in disappointment if the preparation of the land has not been sufficiently thorough and complete. Very few progressive farmers in this district would attempt to grow wheat—a comparatively hardy drought-resistant crop—on anything but well-prepared fallow land; but there are many farmers who sow rape, pease, rye and vetches, or barley, for forage purposes on land scratched over a week or two before sowing, and are disappointed if the growth is not satisfactory. But what kind of a wheat crop might be expected from this treatment? It may be said that wherever rational treatment has been afforded these winter forage crops, they have done well, and have proved profitable. The important feature in their use (apart, of course, from the profit to be made in feeding down with sheep) is that organic matter—the most important soil constituent, the soil's life-blood so to speak—is added to the land. This organic matter enables the soil to be worked more readily. (Mr. P. Bone, who grew a crop of peas last year on half his paddock, noticed a remarkable difference in the draught of the implements in working the pea land as against the cereal land in the same field.) Moreover, the fertility of the land is considerably increased by the practice of sowing forage crops and feeding them down with sheep. This, of course, means increased productive power and bigger wheat crops

when the paddocks come to be sown in wheat. As the drain on the organic matter of the soils of our wheat areas through the burning of the stubbles and the constant fallowing is considerable, systematic efforts will need to be made sooner or later to arrest the depletion of humus. This depletion of organic matter of the soil is one of the most serious soil problems in the arid wheat areas, and the falling off in soil fertility is already noticeable in the older districts.

The organic matter can only be restored in four ways; first, by the direct application of stable manure, which is at present an impracticable proposition on our wheat farms; secondly, by laying the land out to grass for a number of years, a method which cannot be followed with profit on average sized wheat farms; thirdly, by the growth of green crops (which gather 95 per cent. of their bulk from the air) and the ploughing under of this green stuff; and, finally, by the growth of forage crops and feeding them down with sheep. This latter method is within the range of ordinary farm practice, is far more effective than allowing the land to be in grass, and will ultimately result in greatly improved yields.

Rotation Systems.

The method of cropping generally practised was the four-course Wimmera rotation—fallow, wheat, oats, grass. The wheat is sown with 60 lbs. of superphosphate per acre; the oats are generally disced in on the wheat stubbles with 35–40 lbs. of superphosphate, and either cut for hay or stripped. The third year the herbage springing up from the oat stubbles is grazed, and the fourth year the land is fallowed up for wheat. Several variations of this rotation were in vogue on different farms. A number of farmers steadfastly adhered to the practice of sowing oats and wheat on nothing other than well-fallowed land. The reasons for this practice were—(1) that oats on fallow give far heavier crops than oats on stubbles; (2) there is less risk of "Take-all" in the subsequent wheat crop; (3) that the net profit per acre is greater.

As a result of a large number of cases investigated, it would appear that during the past ten years the average oaten hay crop on fallowed land was 37–40 cwt. per acre, as against 18–22 cwt. on stubble land—a comparison decidedly in favour of the fallowed land, considering the rental value of the land lies between 5s. and 8s. per acre. Another variation in the rotation was the growing of forage crops for feeding off with sheep alternately with wheat and oats. The advantages accruing from this practice have already been discussed. Still another form of rotation was the elimination of the oat crop, thus making the three-course rotation—wheat, grass, and fallow.

Whatever differences may be found in the methods of culture, there were two features upon which all the best farmers were agreed—(1) that a rotation of crops of some kind was necessary to secure the best results; (2) that the best preparation for wheat—the main crop in the rotation—was a thoroughly well-worked bare fallow.

Early preparation of the fallows and subsequent thorough working are the prime factors for success in wheat growing in a district like Nhill, and it is very gratifying to note that the majority of farmers realize how important the conservation of soil moisture in the fallow is to the success of the subsequent crop. In one typical well-worked fallow, a series of soil samples to a depth of 3 feet was taken, and the moisture-content determined. The results are extremely interesting, and

indicate the reserves of moisture to the credit account of the next season's crop in the *Soil Bank*—

MOISTURE IN WELL-WORKED FALLOW, NHILL, 1913.

	Percentage of Moisture.	Tons of water per acre.
First Foot	26·60	399·0
Second Foot	34·86	522·9
Third Foot	31·62	474·3
		1,396·2

This shows that the weight of water in the first 3 feet of an acre of well-worked Nhill fallow was 1,396.2 tons, and equivalent of nearly 14 inches of rain. In order that the amount of moisture conserved might be as high as possible, the practice of "summer fallowing" is coming into vogue, *i.e.*, the land is disced over in January or February to receive the early autumn rains, and the harrows are kept at work till after seeding when the land is ploughed. The fallow is then kept cultivated through the spring and summer, and is in excellent fettle for the reception of the seed in the following autumn. The amount of work put in the fallows by some competitors would probably seem surprising to many farmers. In one instance which came under notice the land was skim-ploughed in February, harrowed immediately after ploughing, and kept harrowed after each rain till July, when it was ploughed. From July till 1st December the land was harrowed once and cultivated no less than five times. Last season's preparation was no less thorough, and a 40-bushel average crop over the whole farm for 1913 was the reward of such thorough cultivation.

MANURING.

Superphosphate was universally used on all the farms on the main crop, and the quantity used ranged from 56–80 lbs. Nitrogenous manures are not likely to give profitable returns on Wimmera soils, except in seasons of heavy rainfall and on stubble land, as it has been demonstrated that the process of nitrification is extremely active in well-worked Wimmera fallows.

Improvement may possibly be made in the method of applying phosphates. While the application of ½ cwt. of super. is no doubt highly profitable, there is very good reason for believing that heavier dressings could be applied with considerable profit in the majority of seasons. The comparatively high-lime content of Wimmera soils enables heavier dressings to be effectively applied. A few of the more adventurous farmers have applied dressings of 120–130 lbs., and on the red land particularly the results have been extremely satisfactory. The heavy dressings not only give greater yields per acre, but their stimulating effect is also observable on the grass in the year of pasture.

Thomas' phosphate usually shows at a disadvantage when sown alongside superphosphate under field conditions, because of its slower acting, but its effect on grass is very marked and lasting, and for this reason is worthy of trial in conjunction with superphosphate.

Farmyard manure is treated with scant ceremony on Wimmera farms. While the amount produced on a wheat farm is inconsiderable

in comparison with the total acreage, and for that reason cannot materially influence the fertility of the farm as a whole, there is no reason why it should not be carefully conserved and utilized on a small area set apart for the growth of hay and forage crops. The improving effects following on the growth and feeding off of forage crops with sheep have already been touched upon.

SELECTION AND TREATMENT OF SEED.

Less attention is given to the selection and treatment of seed than to any other branch of farm practice. The greatest care and pride is taken by every progressive farmer in the breeding and mating of his draught stock, and the benefits accruing from the use of sound pedigreed sires are too well known to need discussion; but, whilst every one will readily agree that vast improvement may be effected in dairy cows, draught horses,

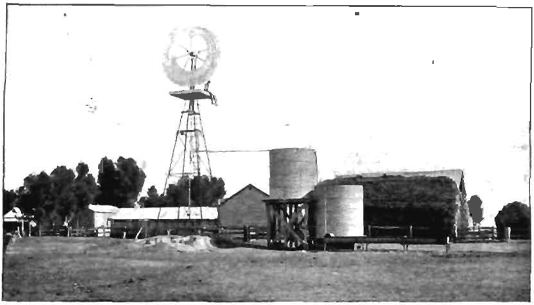


Fig. 3.—Water Supply and Farm Buildings, Mr. G. S. Crouch's Large Farm. **(See page 107.)**

merino sheep, and laying strains of poultry by careful selection and breeding, it does not seem to be generally recognised that similar improvements can be effected with the varieties of wheat under cultivation, and that the laws which hold good in the animal kingdom likewise hold good in the vegetable kingdom. Numberless experiments have demonstrated *that the yield of any given variety can be increased from 15 to 20 per cent. by repeated systematic selection.*

So far as the varieties to choose are concerned, well-tried types like Federation, Yandilla King, and Dart's Imperial may be relied upon to give a good account of themselves in ordinary seasons. Some competitors grew nothing else but Federation; others, again, had not an acre of this variety. With respect to varieties, it is a good plan not to have all one's eggs in the one basket. A good prolific early wheat is badly needed in this district. Bunyip has proved unreliable, Steinwedel and Viking bad shakers, and King's Early tends to go down, and Triumph makes too much flag growth and not enough grain.

Care needs to be taken in the grading and pickling of the seed. Graders are by no means universal on the farms, though the best farmers refuse to sow any but graded seed. In a series of experiments at the Wyuna State Farm last year, the use of graded seed resulted in a profit of 8s. 10d. per acre over and above that of the ungraded seed—equal to £43 10s. on 100 acres of crop—an extra yield in one season sufficient to pay for the cost of the grader and yield a handsome bonus as well. Some of the graders in use on the farms do not grade the seed effectively. The most reliable type to use is undoubtedly the centrifugal barrel grader fitted with revolving screens.

In spite of repeated solicitations on the part of judges on previous occasions, pickling of the seed has not received the attention it deserves. Smut is one of the few diseases that can be absolutely controlled by the farmer, and it is rather surprising that there should be paddocks entered for competition which were in reality reeking with ball smut.

EXPERIMENTATION.

It is very gratifying to learn that the spirit of experimentation has taken a firm hold on the Nhill farmers. While the conduct of exact experimental and research work is always costly, and for that reason can rarely be undertaken by the private farmer, whose main concern is to reap large profits, it is nevertheless true that there are many interesting experiments that can be carried out with very little expense by every farmer. Among these, the growing of small areas or plots of new crops, the testing of different systems of tillage, and the trial of new varieties of wheat, and trial tests with fertilizers may be mentioned. Over a decade ago, when the Department of Agriculture initiated a series of manurial tests to demonstrate the value of phosphatic manures on wheat land, the Nhill farmers were among the most enthusiastic of experimenters. The spirit of experimentation has developed, and finds its expression in trials of new varieties of wheat, oats, barley; the growth of rape, pease, melilotus, rye and vetches for feeding down with sheep; and tests of different methods of working the fallows. That these tests are actively conducted amid the bustle of farm work indicates a healthy desire for progress, and helps to explain the progressiveness which has always characterized the farmers of the district.

LARGE FARMS.

The prize for large farms is awarded to Mr. G. S. Crouch, of Kaniva. Mr. Crouch's farm is 3,460 acres in area, of which 520 acres are under crop, 590 acres lying in fallow, 400 acres in timber, and 1,950 acres in grass. The homestead is nicely laid out, the house well built and compact, and trees for shelter and shade nicely placed. The stock comprise 14 working draught horses, 10 young draughts, and 10 light horses, 7 head of cattle, 2,030 head of sheep, including 520 pure merino breeding ewes.

Considerable attention is paid to sheep on this farm. Formerly Shropshire-merino cross was favoured for the production of lambs for the freezing works. Under the conditions prevailing at Kaniva, however, Mr. Crouch finds that pure merinos for wool production suit him

better. He finds that on the Kaniva pasture three merino sheep can be reared for nearly two crossbred sheep that can be fattened for export, and his merino wool gives him better net returns. One thousand five hundred and thirty-two sheep and 670 lambs were shorn this year. From the sheep, 32 bales of wool were obtained, which averaged 11¼d. per lb. The average cut per sheep was 10 lbs. 2 ozs. The 670 lambs gave an average cut of 3 lbs. 3½ ozs. A good serviceable shearing-shed, with simple, convenient, and effective drafting-yards and sheep-dip, have

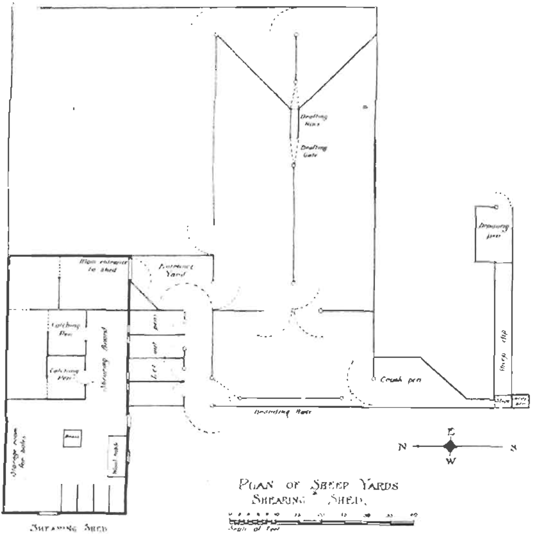


Fig. 4.—Plan showing arrangement of shearing shed, sheep yards, and sheep dip, Mr. G. S. Crouch's Prize Farm.

been built, a sketch plan of which is shown in Fig. 4. It will be noted that the sheep enter the dip by a side slide, and pass through the dip at right angles to the direction of entry. The addition of a second draining-pen at the end of the dip, to allow one batch of sheep to drain whilst others are being dipped, might be suggested as an improvement on an otherwise excellent dip.

The lay-out and subdivision of this farm is not such as to facilitate the best and most economical working, the paddocks being of irregular

sizes, wanting in systematic arrangement, and in some cases difficult of access. This has doubtless arisen from the periodical enlargement of the original farm by the acquisition of neighbouring land.

Good provision has been made for water supply and storage. Two wells have been sunk to a depth of 150 feet, and slabbed with 8-in. x 2-in. redgum. Over one of these wells, a 12-in. windmill has been erected on a 30-ft. stand. The water is collected in two 2,000-gallon tanks, and gravitates to the homestead, farm buildings, vegetable garden, orchard, and shearing-shed, whilst the overflow runs into a 1,000-yard dam. Nine tanks, with an aggregate capacity of 10,500 gallons, are attached to various buildings for conserving rainwater, and for storage purposes. The requirements of the stock are catered for by 25 dams, averaging 800 yards each, disposed in such a manner as to facilitate economical watering. Capacious iron troughs, fitted with ball taps, are placed near the stables and windmill.

The farm buildings comprise a neatly built, well-ventilated, lofty, iron stable and chaff-house, 100 feet x 22 feet; a shearing-shed 50 feet x 28 feet, with solidly constructed well-arranged drafting-yards and sheep-dip; a galvanized-iron implement-shed, fitted with wire doors; a hay-shed; and numerous loose boxes. This was the only farm on which provision was made for the storage of hay under a roof. If farmers would only realize the advantages to be gained from the use of suitable hay-sheds, the erection of such sheds would soon be undertaken. The amount of damage done every year to unprotected hay-stacks and the cost of labour involved in topping and thatching a stack will considerably exceed the annual interest on the cost of a well-built hay-shed.

The farm implements were in first-class order, and those most subject to wear and tear were placed under cover of the implement-shed.

The crops were well grown, and gave promise of excellent yields. They were very clean, remarkably free from disease, very uniform in character, and reflected great credit on the owner. The only varieties sown were Federation and Yandilla King. Considerable judgment was displayed in the working of the fallows.

The horses were in excellent condition. Some of the draught mares were of good quality, and the young stock looked particularly well. Mr. Hoffman's draught stock was more uniform, and generally superior to Mr. Crouch's, though the latter's young stock was of better quality.

Pure-bred merino sheep were used for wool production, and the 520 breeding ewes were of high quality, being big-framed robust animals with dense compact fleeces.

As a general rule, very little care is bestowed by the wheat-farmer on his cattle, pigs, and poultry, and these stock on the farms this year were no exception to the rule. Neither in the quality nor in the manner of treatment of these farm stock was there much to arouse enthusiasm.

Mr. Crouch is to be complimented on the success of his farming operations, the condition of the crops and fallows, the business-like character of the farm buildings and equipment, and the all-round evidences of careful and skilful management. His is a large holding, and, when the amount under cultivation bears a bigger ratio to the amount under grass, the annual income will be considerably increased.

Mr. Hoffman's farm is well laid out for economical and effective working, but many of the subdivisional fences require attention, and good well-swung gates are needed. The homestead was well situated, and is surrounded by a shelter of gums and a neatly kept garden.

The draught stock were uniform and remarkably good quality, and much above the standard usually found on farms.

Two hundred full-mouth merino ewes of good quality were grazing on the farm. Mr. Hoffman's practice is to mate Merinos with Lincoln rams for the raising of export lambs. He purchases merino ewes as two-tooths, and secures three lots of lambs before finally disposing of them.

The poultry section received careful attention, and a good class of white and brown leghorns were kept comfortably housed.

The farm buildings, though substantial and well built, are not so complete and well planned as Mr. Crouch's, nor is the provision made for water supply and storage so effective.

A neatly kept orchard and vegetable garden, with a fine belt of sugar-gums for shelter, gives a very pleasing appearance to the homestead.

SMALL FARMS.

The first prize is awarded to Mr. W. Dahlenburg, who is to be congratulated on the all-round merit of his farm and the amount of work accomplished on his holding. The general lay-out and balance in the subdivision of this farm are good, and greatly assist in the economical working of the area.

The fences, boundary and subdivisional, are in good order, and a large amount of new fence has been erected during the year.

This is one of the few farms on which the familiar "barbwire gates" have been absolutely banished. Twenty-two neat, 14-ft., well-swung, wooden gates have been placed over the farm in such positions as make for economical working of the teams. The amount of time saved in opening and shutting these gates, as compared with the intricate barbwire creations, to say nothing of the mental relief experienced, amply repays the owner the interest on the capital cost.

The farm comprises 840 acres subdivided into eleven paddocks. Substantial provision has been made for water supply. Eleven dams, with an aggregate capacity of 13,000 yards, supply the requirements of stock. Water is laid on to the homestead, stables, and orchard from a mill fitted on a 30-ft. stand. No well has been sunk on the property, but reliance is placed for homestead supply on a 2,500-yard dam.

The farm buildings are very conveniently arranged, and comprise a stable 66 feet x 21 feet, barn 45 feet x 15 feet, engine-house 21 feet x 15 feet, and chaff-shed and feed-room 20 feet x 36 feet, under the one cover, 86 feet x 36 feet, floored throughout with jarrah sleepers, and spanned by two semicircular roofs.

The hay-stacks are so disposed as to facilitate the ready cutting of chaff.

A well-constructed implement-shed, 45 feet x 24 feet, with a semicircular roof, is fitted with double gates on both sides, so that teams may drive right through the shed.

Other interesting features of the farm-steading are the provision made for workmen, the sheep-yards, the solid character of the fencing, and the belts of sugar-gums surrounding the homestead and farm buildings, and the reserve supplies of straw and hay.

A sight somewhat unusual on wheat farms was a fine flock of pure-bred black Orpington fowls, comfortably housed, with a shed fitted with an incubator and brooder.

The stock on the farm were uniformly good—the draughts, in particular, being of high merit and uncommonly well cared for. The ten workers were big-framed, robust, active animals, with good bone and sound legs.

The rotation practised is the Wimmera four-course system—fallow, wheat, oats, grass. A small amount of melilotus—1 lb. per acre—is usually sown with the oats and cut for hay. This amount is sufficient to improve the palatability and the protein-content of the hay without causing scouring in the horses.

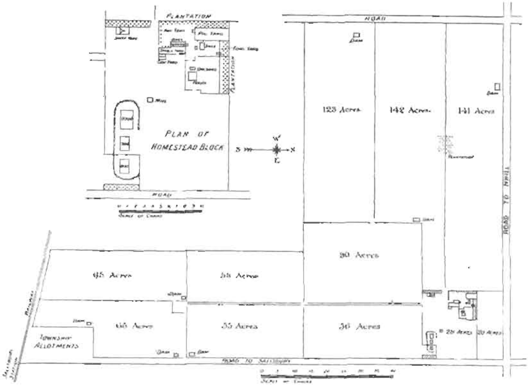


Fig. 5.—**Plan of Layout and Subdivision of Mr. W. Dahlenburg's Small Farm.**

The crops were very good, and the fallows gave evidence of skill and judgment in working. Advantage was taken of the moist spring to sow a considerable area of sandy land in the midst of a wheat field with Carmen, Up-to-date, Bismarck, and Redskin potatoes. The resultant crop, though the section was not irrigated, was excellent, and demonstrates how responsive the Wimmera soil would be in good seasons or under irrigation.

The whole farm gives unmistakable evidence of skill in management and attention to the minutest detail, and Mr. Dahlenburg is to be congratulated on the all-round merit of his holding.

The second prize is awarded to Mr. O. Lienert, of Lorquon, whose 885-acre farm bore evidence of considerable skill in working.

A comfortable house of eight rooms has just been erected, and a good start has been made in laying out an orchard and vegetable garden.

The outstanding features of this farm are the provision made for water supply, the character of the farm implements, the methods of working, and the excellence of the crops.

While the general lay-out of the farm is good, the farm buildings are very scattered and inferior in character, and the "barbwire gate" is unduly conspicuous.

The stock are not as good as Mr. Dahlenburg's, though the crops are, on the whole, considerably better.

Mr. Lienert is probably one of the few farmers in the district who sowed no Federation wheat this season, and who sows his wheat and oats only on fallowed land. His main cropping varieties are Yandilla

Fig. 6.—Mr. O. H. Lienert's Second Prize Crop of Yandilla King Wheat.

King and Viking. The Yandilla King was a remarkably well-grown level crop, very free from rust, and will probably average over eleven bags per acre.

His oaten hay crop, grown on fallowed land, was one of the best in the district.

Other varieties of wheat grown are Viking, Huguenot (for hay), Triumph, and Leatherhead. These latter varieties look very showy and attractive in the field, but in yield are not likely to excel Federation.

Mr. Klinge's farm is divided into two sections, one a compact area of 320 acres, including the homestead, and a Mallee block of irregular shape, 2 miles distant, which makes economy in working and proper supervisory control difficult.

The provision made for water supply is good, the farm buildings serviceable and commodious, and the farm equipment is very complete.

Mr. Batson's farm has not reached the same stage of development as the other farms, though an excellent start has been made.

LARGE FARMS.

	Farm and Farm Equipment—45.						Stock—25.					Crops, Fallow, &c.—30.				
	Best Provision for Water Supply and Storage.	Lay-out and Subdivision of Farm, and Character of Fences and Gates.	General Farm Equipment and Implements.	Arrangement and Character of Farm Buildings.	Orchard and Vegetable Garden.	Tree Planting.	Horses.	Sheep.	Cattle.	Poultry.	Pigs.	Character, Condition, and Value of Crops.	Provision for Fodder Reserves and Insurance.	Condition of Fallows.	System of Cultivation, Rotation, and Cropping.	Total.
Maximum Points	15	8	8	8	4	2	12	6	3	2	2	12	8	5	5	100
Name of Competitor.																
G. Crouch	14	6	7	7	2	1	9	5	2	1	1	10	4	4½	3	76½
E. Hoffman	10	7	6	4	3	1	11½	5	1½	1½	0	7	4	3	4	68½

SMALL FARMS.

W. Dahlenburg	12	7	7	7	2	2	11	5	2	2	2	9	5	4	3	80
O. Lienert	13½	5	7	5½	3	1½	10	4	1½	1	1½	11	3	3½	4	75
G. Klinge	13	5½	6½	4½	2	1	11	5	2	1½	0	9	4	3	3	71
W. Batson	10	5	6	5	3	1	9	4½	1	1½	1½	7½	4	3	3	65

CROPS.

There were 23 entries for this section, and, of these, eight represent crops grown on Mallee land.

On the whole, the crops were remarkably good, and bore testimony to the efficacy of the farming practice of the district and the responsiveness of the wheat to the generous spring rains.

In judging the crops, the following points were taken into consideration:—Freedom from weeds, 15 points; regularity and evenness of crop, 15 points; freedom from disease, 15 points; purity and trueness to type, 20 points; and apparent yield per acre, 35 points. It would, of course, be manifestly unfair to make yield per acre the sole criterion of judging a crop, for this would give those who possessed the best land an undue advantage over those who, by force of circumstances, have to work comparatively poor land. I need only add here that more attention needs to be given by competitors to the treatment and selection of their seed. The varieties most favoured were Federation, Dart's Imperial, and Yandilla King, but in very few instances was the seed of these varieties true to type and uniform. Systematic selection of the seed after the same methods as are followed by the animal breeder in the improvement of his stock was not practised by a single grower; and in very few cases was the seed carefully graded before sowing.

The improvements wrought in our system of farming during the past decade have aimed at making soil conditions more suited to the plant's needs, but little has been done in the systematic improvement of the wheat plant itself, though the possibilities in this direction are enormous. There has been a too-feverish desire shown to change the seed from one locality and one farm to another, in the hope that some slight improvement might be brought about. But how can this indiscriminate changing of seed result in any improvement, more especially if the farmer secures the seed from one who is equally careless as himself in respect to the selection of seed? Changes of seed may in special circumstances be sometimes of value, but in the generality of cases it is very undesirable, especially when the extent of the change is considerable. The extreme instance of this kind may be observed in the remarkably poor growth made by imported varieties when grown for the first time in Australia. A preliminary period of acclimatization is usually necessary before even tolerably good results are secured.

There is good evidence to show that farmers should rely on their own seed rather than change their seed promiscuously every few years, and that the alleged advantage accruing from the use of a change of seed is based more on opinion than on well-ascertained fact.

Farmers are strongly urged to secure good reliable seed of the variety which thrives best under their conditions—keep rigidly to that variety and keep it pure and true to type, and endeavour to maintain, and even raise its standard of prolificacy by systematic selection and careful grading. If this be done, there will be no desire for a change of seed, and

the prolificacy of the seed will improve as year succeeds year. The following table shows the result of the crop competition:—

BEST CROP, 1913.

Name.	Freedom from Weeds.	Freedom from Disease.	Purity and Trueness to Type.	Evenness.	Apparent Yield.	Total.
Maximum Points ..	15	15	20	15	35	100
J. Collins, Ni Ni ..	14	13	19	14	34	94
O. H. Lienert, Lorquon..	14	14	18	14	32	92
Geo. Batson, Haycroft ..	14	14	18	15	30	91
Geo. Crouch, Kaniva ..	14	13	18	13	29	87
J. Goodwin, Kaniva ..	13	10	18	13	31	85 }
A. F. Wohlers, Winiam	13	13	17	13	29	85 }
J. Bond and Sons, and Schultz, Broughton ..	12	13	17	13	28	83
G. H. Voght, Winiam ..	13	14	17	13	25	82
Lawson, Muir, Broughton	12	11	16	12	28	79 }
J. B. Marshall and Sons, Lorquon	14	12	15	13	25	79 }
Julius Reichelt, Lorquon	13	12	16	12	26	79 }
Boothey and Gladigau, Winiam	12	10	16	13	26	77
MacDonald and Parkin, Haycroft	10	11	14	11	24	70 }
Ivan Young, Miram ..	13	13	15	12	20	70 }

BEST CROP, 100 ACRES ON MALLEE LAND, 1913.

Name.	Freedom from Weeds.	Freedom from Disease.	Purity and Trueness to Type.	Evenness.	Apparent Yield.	Total.
Maximum Points ..	15	15	20	15	35	100
M. M. McKenzie, Glenlee	13	13	17	13	25	81
D. R. McKenzie, Glenlee	12	12	17	12	27	80
G. R. Klinge, Gerang ..	13	13	16	12	19	73
Paul McKenzie, Winiam	12	12	16	13	19	72
B. W. Schultz, Glenlee ..	11	12	14	13	21	71
F. W. Schultz, Glenlee ..	11	12	14	13	20	70
J. Dart, Woorak West ..	12	11	15	12	17	67

The first prize is awarded to J. Collins, of Ni Ni, with a well-grown crop of Federation wheat. The crop was remarkably even in growth, very true to type, and will probably yield twelve bags per acre.

The prize for the best Mallee crop is awarded to Mr. M. McKenzie, of Glenlee, for a well-grown even crop of Federation.

FALLOW LAND.

The competition in this section was very keen, and, on the whole, the fallowing was very thoroughly done. The principal aim in bare-fallowing is, of course, to store and conserve as much moisture in the subsoil from the preceding year's rainfall as is possible.

In judging the fallows, the following points were taken into consideration:—

(1) The amount of moisture conserved in the soil and subsoil below the mulch.
(2) The depth, character, and efficiency of the mulch, and its suitability for preventing further losses by evaporation.
(3) Freedom from weeds.
(4) Regularity and evenness of surface—for this is an indication of the judgment displayed in working.
(5) The size and condition of the surface clods.

The following table summarizes the points awarded:—

BEST AREA OF FALLOW LAND, 1913.

Name.	Moisture.	Mulch.	Weeds.	Evenness.	Surface Clods.	Total.
Geo. Greenwood, Gerang	10	9½	10	9½	10	49
J. Collins, Ni Ni ..	10	9	9½	9	9½	47
Peter Bone, jun., Woorak	8½	9	8½	9	9	44
W. E. Dahlenburg, Salisbury	8½	9	9	8½	8½	43½
E. G. Gladigan, Gerang ..	8½	8½	8½	8½	9	43
O. H. Lieuert, Lorquon ..	9	9	8½	8	8½	43
Geo. Crouch, Kaniva ..	8½	8½	9	8½	8½	43
John Goodwin, Lillimur ..	8	8½	9	8	8½	42
Wm. Batson, Haycroft ..	9	8	8	8	8½	41½
T. R. Walters and Promitz, Woorak ..	8	8	8	7½	8	39½
Schultz	7½	6½	7½	7	8	36½
J. Bond and Son and Schultz, Broughton ..	7½	6	7	8	7½	36
D. R. McKenzie, Glenlee ..	7	7½	6½	7½	7½	36
Voight	6½	6	6½	5	6	30

The prize is awarded to Mr. W. G. Greenwood for a magnificent exhibition of fallow land. The standard set by this farmer would be difficult to surpass. The whole area under fallow was covered with a liberal and effective soil mulch, beneath which was a subsoil laden with moisture. The fallow was very uniform in character, free from weeds, and with a fine, firm seed-bed at the bottom of the furrow and a loose even, cloddy surface on top—an ideal combination for this season of the year. The long straight tracks left by the cultivator tines, and the regularity and finish apparent everywhere, demonstrated that the fallowing was the work of a master craftsman.

Of high merit, too, was the work of Mr. J. Collins, of Ni Ni, who was awarded second prize with an excellent area of fallow.

CONCLUSION.

In conclusion, I wish to congratulate the society on the success of the thirteenth farm competition, both in the number of entries and the high standard of merit displayed by the winning competitors.

The success of these competitions has been in no small measure due to the untiring energy and whole-souled enthusiasm of the popular secretary—Mr. C. H. Towns—on whom has fallen the task of organizing and conducting the work for the past thirteen years.

I would suggest that the time is ripe for a grand champion competition during 1914, in which the 26 previous prize winners for large and small farms would be eligible for competition.

Fig. 7.—Mr. J. Collins' Prize Crop of Federation Wheat.

The entries of farms have not been numerous latterly, this being due to the fact that previous prize winners have, by an unwritten law, refrained from taking part. If these and other promising competitors were given twelve months to prepare for a championship competition, the benefit that would accrue would be considerable. An accurate and authentic record of the internal working, management, equipment, and results of, say, the best half-dozen farms in the Western Wimmera would be of the greatest educational value to the wheat-producing interests of the State, and the Nhill Agricultural Society would be doing a great educational work in organizing and conducting such an interesting and valuable competition.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART XI.—PACKING—*Continued.*

(Continued from page 32.)

By E. Meeking, Senior Fruit Inspector.

As though in confirmation of the plea put forward during the past six or seven years in the columns of this Journal for the introduction, on the part of growers and fruit exporters of this State, of altered methods of handling and putting up our fruit for export, the criticisms and complaints from buyers and sellers in Great Britain and on the Continent of Europe regarding the unsatisfactory condition of the fruit on arrival, have, during the season just ended, been more numerous than ever. These have referred to the want of uniformity in grading, both for size and general quality, the inferiority of packing methods, the multiplicity of brands used on cases, and the absence of uniform standardized grade marks. These matters will be dealt with seriatim, and an attempt will be made to show how the present defects in connexion therewith may be remedied.

It is possible that these defects are exaggerated by the buyers and sellers at the other end for purposes of their own, but, after making due allowance for this, there is reason to believe that there is room for improvement.

The Necessity for Standardized Methods of Packing.

There is no need to describe in detail the methods which have been adopted by our growers and exporters in preparing their fruits, both for the local, Inter-State, and oversea markets. Although most of our growers attempt in a perfunctory manner (each grower according to his individual idea) to pack fruits of similar sizes in each package, and to place on the outer covering an indication pertaining to this, no attention has been given to the matter of estimating and standardizing the quantities of apples of various sizes which may be properly packed in the case. The necessity for careful grading has therefore never been forced upon the packer, and, as before mentioned, he has never acquired the "knack" of discriminating rapidly and correctly the difference between apples of various sizes unless these vary at least a quarter of an inch in diameter. Thus, although the diagonal pack has been used in this State for many years, the absence of applying the numerical system in conjunction with this has prevented the fruit being packed with the desired uniformity with regard to size.

On examining a case of fruit intended for export, the officers of the Department often find that, in addition to the general want of proper uniformity in the sizes throughout the case, the packer, when nearing the completion of the package, has often to pack a few apples of much smaller dimensions than the average size throughout the case, in order to fill the remaining spaces in the package. As this occurs upon the top rows of the fruit, it results in making the grade of fruit appear even more irregular than is actually the fact.

The Importance of Grading for Colour and Shape.

Apart from grading for size, the question of grading for colour and normality of shape has been given little or no attention by the major portion of our growers. The importance of careful attention to these matters cannot, however, be too strongly emphasized, as without such attention perfection in packing cannot be attained. The difference in appearance in a case carefully graded with regard to size, but packed without regard to uniformity of shape and colour, in comparison with a case packed when the latter details have been attended to, is more striking than would be imagined, and must be seen to be believed, particularly when the red-cheeked or red-striped varieties of apples are used. The diagonal-numerical system of packing should, of course, be used in conjunction with grading for colour and normality of shape, as a case of fruit put up without the application of this system cannot be held to properly fill requirements with respect to uniformity of sizes, this being the only system which demands that grading for sizes must be thoroughly carried out to insure that packages shall contain fruits of uniform sizes throughout. This numerical system can be applied to fruits other than apples, and some of the packs in connexion therewith will be explained later. Before describing these, an indication of what is meant by grading, or standardizing the packs for apples and other fruits, will be given.

Present Legislation Governing Oversea Fruit Export.

At present, fruits shipped from Victoria to oversea countries must comply with the provisions of the Commerce (Trade Descriptions) Act and regulations. These demand that the trade description must include a true description of the goods, the word "Australia" and the name of the manufacturer or exporter, or his registered brand. In instances where cases are packed with fruits of various sizes in such a manner as to deceive the buyer, the trade description must include the word "unsorted." If apples are under 2¼ inches in diameter, the trade description shall include, in bold and legible characters, the words "Under 2¼ inches," and if the goods be in an unsound or abnormal condition, the trade description shall include, in bold and legible characters, the words "Second grade." No provision is made to embrace uniformity in packing, colour, size, or the class of package used. All these requirements, however, with, in addition, the provision that packages should be free from diseased, bruised, or other abnormal specimens, are necessary to provide that our fruits shall be packed for market in an ideal manner.

Suggested Alterations to Present Legislation.

If the word "quality" were used, all these provisions could be embraced, and also the condition as to soundness or freedom from disease. "First quality" might then be made to consist of well-grown specimens of one variety, free from disease, bruises, damage, decay, and other defects, of uniform size and shape, of good colour for the variety, and, in the case of apples, properly packed under prescribed methods in standard packages. "Second quality" to consist of well-grown specimens of one variety, free from disease, of not less than

normal size and shape, of good colour for the variety, of not less than 95 per cent. free from bruises and defects other than those caused by disease, and, in the case of apples, properly packed under prescribed *methods in standard packages.* "*Third quality*" to consist of specimens of not less than medium size for variety, not less than 95 per cent. free from bruises and defects other than disease, and, in the case of apples, properly packed under prescribed methods in standard packages.

Fruit submitted for examination could be graded and marked as provided for in the provisions of the regulations, as follows:—

"First quality"—Fruit graded at 95–100 points.
"Second quality"—Fruit graded at 90–95 points.
"Third quality"—Fruit graded at 85–90 points.

No fruit other than that of "First," "Second," or "Third quality" to be graded. The following points to be awarded:—

Condition (including freedom from disease, decay, bruises, and other defects), 40 points (maximum).
Uniformity of size (to include uniformity of sizes throughout package), 25 points (maximum).
Uniformity of colour (to include uniformity of colour throughout package), 10 points (maximum).
Shape (to include normal shape for variety), 10 points (maximum).
Packing (to include tightness of pack according to prescribed methods), 15 points (maximum).
Total maximum, 100 points.

The standard should consist of fruit which contains not more than 5 per cent. of specimens bruised or deteriorated from causes other than disease; 5 per cent. of specimens of less than normal size; 15 per cent. of specimens of uniform colour for the variety; and 5 per cent. of normal shape for variety.

Altered Methods can be Brought About.

The matter of preparing our fruits for market under the system mentioned may appear to many of those engaged in our fruit industry very difficult, if not almost impossible, of accomplishment; but such is really not the case. If the exporter conformed to the standards herein set out, the whole question of putting up our fruits in an ideal manner would be solved, and a guarantee of quality would be furnished both the buyer and seller when the fruits arrived on the market.

In some countries, standard grades on the lines indicated have been applied to apples, and three or four grades have been adopted and applied with success. In the United States, the best grade has been termed "Extra fancy." Various names have been adopted for the other grades, according to the State or locality of the association which puts up the fruit. In Canada, grades have been fixed by legislation, and the Fruit Marks Act of that country demands that all persons who put up fruit for sale in boxes must brand the same with one of the following grades:—"Fancy, No. 1"; "No. 2"; or "No. 3."

Voluntary Adoption of Standard Grades in America.

In many parts of the United States, the various Fruit-growers' Co-operative Associations have voluntarily adopted standards. Most of these are even more stringent in their conditions than the Canadian Act, inasmuch as they allow no diseased fruit to be packed for sale.

The North Pacific fruit distributors—Spokane, Washington—who are sole agents for the Yakima Valley Fruit-growers' Association, North Yakima, Washington; the Fruit-growers' Association, Hood River, Oregon; the Wenatchee Central Fruit-growers' Association, Wenatchee, Washington; and some half-dozen other large Fruit-growers' Associations of the Western States of America, issue grade-and-pack rules each season, setting out the designation of the grades to be used and the requirements for each grade. The aim has been to produce a first-class article put up in large quantities under one brand, and, by judicious and business-like distribution, to consign these to all possible markets, and sell them to the best advantage. To show how far the fruit-growers of the Western States of America have advanced in organized and business-like methods of packing and grading their crops, an outline of the instructions issued to fruit-growers for the season 1913 are here given. The instructions, amongst other things, cover the following matters:—

1. Pruning (winter and summer pruning).
2. Cultivation.
3. Cover crops.
4. Irrigation.
5. Thinning with respect to apples, apricots, pears, peaches, and plums.
6. Picking the various kinds of fruits mentioned.
7. Sorting, packing, and grading these fruits.

The scope covered in these instructions will be realized when it is mentioned that they deal with almost every matter in connexion with fruit-growing, from the care and cultivation of the trees to the method in which boxes should be nailed up and stacked and transported on the waggons to the railway or market town; rules for estimating paper and cardboard, and the use of same; numerical tables for apple packs, peach packs, and pear packs; and illustrations showing the method in which the cases should be labelled or branded. Taking apples alone, for the "Extra fancy" grade a table showing no less than 38 varieties, with the minimum number for each variety to go to this grade, is given. The "Fancy grade" contains a similar number of varieties. The single grade, which is a grade between the "Fancy" and "Extra fancy" grade, contains 33 varieties with a minimum size of 163 apples to the box. The three grades mentioned, therefore, total no less than 109 varieties. The "C" grade is made up of all merchantable apples not included in the other three grades.

The Adoption of Standardized Packing justified by Results in America.

These conditions have been so closely adhered to during the past few years that the fruit marketed under the brands of the leading Fruit-growers' Associations in the Western States of America are now so well and widely known that it is no figure of speech to say that they almost sell themselves in the markets of the Eastern States, in Great Britain, and on the Continent of Europe. This has been brought about by the reputation obtained through careful and honest grading, and by the

large quantities which are marketed under the different association brands. The results, in brief, have been so satisfactory in the Western States that no inducement could compel the growers to depart from this system. It must be remembered that the methods adopted have been voluntary, and growers have succeeded largely in working out their own salvation without the aid of legislation. The desirability, however, of shipping and marketing fruits under the ægis of Government sanction is becoming realized, and in the United States legislation has been passed this year which fixes by enactment the conditions under which fruits shall be prepared for market. In Canada, as has already been mentioned, this legislation has for some years been in force for the whole Dominion, and fruit imported, and intended for export or local trade, is controlled by stringent laws.

THE BRANDING OF PACKAGES.

In addition to the grading of fruits, according to the methods mentioned, the marking of packages with an attractive brand or label adds

exceedingly to the general effect, and greatly enhances the value of the fruit in the eyes of the buyer, who naturally concludes that the exporter who is sufficiently proud of his product to place an attractive brand upon same would show a corresponding pride in the matter of uniformity in grading and packing. At the last Royal Agricultural Show, a case of apples packed and put up by the officers of this Department, under methods recommended, was shown alongside another case taken from a consignment intended for export. These are shown in the accompanying illustration, and, although the difference appears somewhat startling, a faint impression only is conveyed by the photograph of the actual difference in the appearances of the cases.

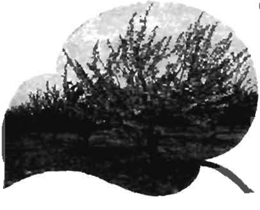
INDIVIDUAL EFFORT POWERLESS TO IMPROVE THE INDUSTRY.

It will be understood, of course, that the highest degree of perfection in picking, packing, grading, handling, and branding packages cannot be attained by individual effort for the following reasons:—

1. Few individual orchardists possess the necessary facilities and conveniences.
2. The attention of the individual orchardist is too much occupied with other matters to give the necessary time and attention to details in grading and packing.
3. The small quantity of fruit which the average orchardist markets does not justify the expense incurred by adopting an attractive brand or label, which can only be applied with perfect success when large quantities of fruit are marketed under the one brand.
4. The orchardist, or the man whom he employs, seldom makes grading and packing a speciality. The natural inclination also exists in the orchardist's mind to consider his fruit somewhat better than that of other growers. This creates a tendency on his part to pack a larger proportion of fruit in his higher grades than may be justified.
5. Each orchardist has a tendency to grade his fruits according to his individual ideas, and in a different way from the method adopted by his neighbours.

The high degree of perfection which has been attained in some parts of the North American continent in grading and packing fruits, has been brought about by co-operative effort, and, so far as Canada is concerned, this has been aided by legislative enactment. Whether this desirable result may be obtained in Victoria will largely depend upon the efforts of the growers themselves, but no prophet is needed to foresee that if attention were given to the matters mentioned, and if these were assisted by legislation, the status of the industry would be incomparably raised, and it is believed the results would justify all the effort required to bring the altered methods into operation.

(*To be continued.*)



ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Spraying.

A final spraying for codlin moth will be necessary this month. Probably, owing to the irregular season, the moth has been more active during this season than last. Larvæ were observed entering the apples late in December and early in January; these probably belong to the second brood. The fallen apples should all be collected and boiled, and all crevices and hiding places searched for larvæ.

The season has been favorable for the development of bryobia mite and woolly aphis; and, as soon as the fruit has been picked from the trees attacked by these insects, a good spraying of strong tobacco water or benzole emulsion should be given. This will minimize to a great extent the winter work.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red-oil emulsion, lime-sulphur and salt spray, or resin wash, will be found useful for the purpose. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an air-tight sheet or tent, and hydro-cyanic gas should be generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care should be exercised in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium should then be quickly dropped into the vessel, and the tent closed down at once; the bottom of the tent all round should be covered with soil to prevent any gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time, or on a cloudy day, and the foliage of the trees must be thoroughly dry.

Young Trees.

Young trees of the citrus family should now be making a good, thrifty growth. The foliage should be glossy, and the general appearance should be a healthy one. Occasional light waterings, as well as a mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a manure mulch; and, if it has not been previously done, unnecessary growths in the centre of the tree should be removed.

Cultivation and General Work.

Guava trees have just finished flowering, and a good watering will be of benefit to them. Persimmon and loquat trees should be watered to

The soil should be kept loose and well worked between the trees, especially if the weather has been at all hot. The surface must also be well worked after every irrigation.

Vegetable Garden.

Liberal applications of water, a plentiful mulching of stable manure, and frequent cultivation of the surface will be necessary during this month.

Young celery plants may be planted out in trenches, and plants that have been previously growing should be bleached by earthing, or by any means that will exclude the light.

Continue to plant out cabbage, cauliflower, celery, lettuce, and other plants from the seed-beds.

Seeds of cabbage, turnip, lettuce, peas, French beans, parsnips, beet, and leek may be sown.

As soon as any block becomes vacant, it should be well manured and dug to prepare it for the next crop.

Flower Garden.

Constant watering and hoeing will now be required to keep the flower garden in a condition of success. Cannas will require manuring, the old flowering stem should be removed as soon as the flowers are past their prime to make way for the new growth. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick-acting fertilizers should be given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied.

A flower that is increasing in popularity is the Japanese iris—Iris Kaempferi. This iris has the reputation of being an aquatic plant, and gardeners have been backward in planting it on that account, and thus for some years have been deprived of a highly decorative and beautiful plant. It has been proved that this iris will grow readily, and thrive remarkably well, under ordinary garden conditions. In fact, it is safe to say that it will bloom just as freely, and probably with better blooms, than it will if grown under moisture. One thing is certain, if the crowns are allowed to remain under or near water in winter time, they will suffer, and probably rot away.

The plants enjoy a good garden loam without any clay; they will take almost any manure, but do not like lime. If plants may be obtained now, they can be planted out, and, being established this season, will flower most readily in the coming spring. Seedlings are easily raised, and may be sown under garden conditions, when they will flower in the second season from planting. A bed of seedlings, two years old, at the Burnley Horticultural Gardens has yielded a wonderful yield of blooms this season.

Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned; the flowering growths removed, and, unless the seed is required, all seedheads should be cut off.

Cuttings of pelargoniums, zonale, and regal, may now be planted; delphinium spikes that have finished flowering should be cut down to make way for new growth, the plant being watered and manured.

Seeds of perennial and hardy annual plants may now be sown; and a few bulbs for early flowering may be planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

VICTORIAN RAILWAYS.

SPECIAL CHEAP RATES FOR SINGLE PACKAGES OF COUNTRY PRODUCE BETWEEN ANY STATIONS OPEN FOR GOODS TRAFFIC BY MIXED OR GOODS TRAINS.

Distance.	Fruit (Fresh or Dried), Vegetables, Cider, Perry and Wine—Produce of the Commonwealth.		Honey, Butter, Eggs, Cream, Cheese, Ham, and Bacon.	
	Per Package not exceeding 30 lbs.	Per Package exceeding 30 lbs., but not exceeding 60 lbs.	Per Package not exceeding 30 lbs.	Per Package exceeding 30 lbs., but not exceeding 60 lbs.
	s. d.	s. d.	s. d.	s. d.
Up to 25 miles	0 4	0 6	0 4	0 6
26 ,, 50 ,,	0 6	0 9	0 6	0 9
51 ,, 101 ,,	0 6	0 9	0 8	1 0
102 ,, 150 ,,	0 8	1 0	0 10	1 3
151 ,, 200 ,,	0 8	1 0	1 0	1 6
201 ,, 250 ,,	0 8	1 0	1 0	1 6
251 ,, 300 ,,	0 10	1 3	1 3	1 9
301 ,, 400 ,,	1 0	1 6	1 6	2 0

Prepaid Owner's risk.

Consignments, fully addressed and consigned to the Melbourne Goods Sheds, will be delivered at any address in the undermentioned places on prepayment of an additional charge of 4d. per package:—Albert Park, Armadale, Ascot Vale, Auburn, Balaclava, Brighton, Brunswick, Carlton, Camberwell, Caulfield, Clifton Hill, Coburg, Collingwood, Elsternwick, Essendon, Fitzroy, Footscray, Glenferrie, Hawksburn, Hawthorn, Kensington, Kew, Malvern, Melbourne, Middle Park, Moonee Ponds, Newmarket, Newport, Northcote, North Melbourne, Port Melbourne, Prahran, Richmond, South Melbourne, Spotswood, St. Kilda, Toorak, Williamstown Windsor, Yarraville.

Melbourne, 12th January, 1914.

Manurial Value of Sewage—

Dr. J. Grossman gave the benefit of his knowledge on the subject of sewage as a manure to the members of the Agricultural Section of the British Association last week.

The total value of nitrogenous matter, phosphates, and potash compounds contained in the liquid part of the sewage in the Old Country, he said, was equal to £20,000,000 per annum, whilst the value of solid matter, termed sewage sludge, was about £2,000,000 per annum.

Dr. Grossman has succeeded in designing a practicable method for extracting the soap and fatty kitchen residues from sewage, thereby rendering it more valuable as a manure. The dried extract, completely sterilized, contained, on an average, 1.5 per cent. nitrogen, 3 per cent. phosphate of lime, and .5 per cent. potash, with 30-40 per cent. organic matter easily decomposable.

Melbourne sewage finds its way to the Metropolitan Farm at Werribee.

THIRD VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1913-14.

Monthly Report ending 14th January, 1914.

The ninth monthly report of the above competition is as follows:—

The high temperatures during the past month have been somewhat trying on the birds, shade temperatures on several days exceeding 100 degrees Fahr., and this figure has been frequently recorded inside the houses. This has necessitated special attention as regards watering the dust-bath, and also under the shelter trees; the hose has also had to be used on the roofs of the houses. These precautions brought the fowls through the heat very well, and no deaths occurred on account of the temperature.

The steady output of eggs has been well maintained; the total production for the month being 8,093, a slight decrease from the previous month. The leader (J. H. Gill, pen 23) still has a decided lead over the next, while the second pen last month (C. J. Beatty, No. 11) has been replaced by J. S. Spotswood (pen 6). Moulting is occurring in several pens, some more than others, the moult being most pronounced in those which have been cooped for broodiness.

The general health of the birds is well maintained, although one or two have shown symptoms of weakness in the oviduct, and have required care and attention; the birds generally, however, are bright in appearance, and still maintain keen appetites.

The food is on similar lines to last month, with an increased allowance of green food, consisting of kale and cabbage with a change to green lucerne occasionally. The grain used is principally wheat, with an addition of oats; cracked maize is only used occasionally as a change of diet.

The rainfall during the month was 87 points, spread over three days.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner	Eggs laid during Competition. April 15 to Dec. 14.	Dec. 15 to Jan. 14.	Total to date—9 months.	Position in Competition.
23	White Leghorns	J. H. Gill	1,142	141	1,283	1
6	..	J. S. Spotswood	1,054	139	1,193	2
11	..	C. J. Beatty	1,055	125	1,180	3
8	..	E. H. Bridge	1,029	143	1,172	4
48	..	Thirkell and Smith	1,040	127	1,167	} 5
35	..	Moritz Bros.	1,015	152	1,167	
31	..	W. G. Swift	1,002	143	1,145	7
10	..	T. A. Pettigrove	1,014	124	1,138	8
7	..	B. McKenzie	991	146	1,137	9
65	..	E. A. Lawson	1,012	109	1,121	10
20	..	C. B. Bertlesmeier	960	152	1,112	11
50	..	A. H. Mould	971	137	1,108	12
21	..	A. Ross	966	137	1,103	13
5	..	G. W. Robbins	954	148	1,102	14
34	..	J. E. Bradley	970	130	1,100	15
30	..	George Edwards	943	148	1,091	16
66	..	W. Featherstone	941	142	1,083	17
2	..	R. W. Pope	929	152	1,081	18
61	..	Jno. Campbell	972	101	1,073	19
40	..	M. D. Noye	936	134	1,070	20
32	..	H. Hanbury	924	137	1,061	21
24	..	Redfern Poultry Farm	911	144	1,055	} 22
67	..	C. Hepburn	907	148	1,055	
26	..	B. Rolls	909	136	1,045	24
41	..	Percy Walker	906	137	1,043	25
58	..	Stranks Bros.	902	133	1,035	26
37	..	C. H. Busst	904	115	1,019	27
33	..	South Yan Yean Poultry Farm	868	149	1,017	28
63	..	A. Sellers	888	120	1,008	29
14	..	F. Hannaford	868	135	1,003	30
47	..	W. McLister	869	124	993	31
52	..	W. G. Osborne	843	141	984	32
12	..	A. H. Padman	836	141	977	33
43	..	Morgan and Watson	874	102	976	34
45	..	D. Goudie	845	128	973	35
62	..	G. A. Gent	828	141	969	36
13	Black Orpingtons	T. S. Dallimore	860	98	958	} 37
42	White Leghorns	A. Stringer	836	122	958	
38	..	M. A. Monk	847	108	955	39
18	..	B. Rowlinson	830	123	953	40
56	..	Schaefer Bros.	818	133	951	41
57	..	Gleadell Bros.	805	144	949	42
59	..	Cowan Bros.	838	107	945	43
3	..	S. Buscumb	807	136	943	44
27	..	J. Sinclair	823	114	937	45
46	Black Orpingtons	T. W. Coto	853	82	935	46
44	White Leghorns	W. A. Rennie	799	132	931	47
22	..	B. Mitchell	800	120	920	48
29	..	S. Brundrett	768	133	901	49
30	Black Orpingtons	Jas. Ogden	759	140	899	50
54	White Leghorns	Jas. McAlloon	779	118	897	51
36	..	A. J. Jones	761	123	884	52
53	Black Orpingtons	A. Greenhalgh	780	102	882	53
55	White Leghorns	P. H. Killeen	763	114	877	54
25	Black Orpingtons	King and Watson	773	98	871	55
51	Black Spanish	W. H. Steer	756	114	870	56
60	..	Watson and Rushworth	704	132	836	57
28	White Leghorns	E. Waldon	707	112	819	58
19	..	W. H. Dunlop	706	105	811	59
17	R.C. Brown Leghorns	S. P. Giles	691	106	797	60
64	Golden Wyandottes	C. L. Sharman	697	94	791	61
4	White Leghorns	Jas. Brigdon	635	119	754	62
9	..	Sylvania Stud Farm	639	110	749	63
15	..	J. Shaw	628	93	721	64
		Totals	55,440	8,093	63,533	

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REPORT ON THE EXPERIMENTAL POTATO FIELDS, 1912-13.

By Geo. Seymour.

The experiments conducted during the period under review were a continuation of the previous year's work. Plots were established at the following centres:—Alberton, Leongatha, for varieties and manure tests; Warrnambool, for varieties only; and Port Fairy, for artificial manures exclusively.

LEONGATHA PLOT IN THE SEASON 1911-12.

This plot was established in the season 1911-12 for the purpose of testing the resistance to disease of different varieties; but as the blight did not make its appearance during the seasons mentioned, no information was collected. It was also decided to apply dressings of superphosphate to confirm the results obtained during 1911-12 with regard to the action of phosphoric acid in checking the attack of eel-worm. On harvesting the crop that season it was found that the unmanured section showed quite 50 per cent. more diseased tubers than the section dressed with superphosphate. On this occasion accurate data was obtained confirming the previous year's results. The manure dressings were as follow:—

Superphosphate, 224 lbs. per acre.
Thomas' phosphate, 265 lbs. per acre.

The total weight of tubers affected with eel-worm on these sections was 210 lbs., whilst the total weight on the unmanured section was 1,610 lbs. This matter is worthy of further investigation. Results shown in Table I.

ALBERTON PLOT.

The work on this plot was a continuation of the previous season's operation. The season was not as favorable for growth as the previous one, and the manure test was, to a certain extent, spoilt by frost, which

attacked the crop in a slight depression on the superphosphate section. Consequently, this section shows a lighter yield than the Thomas' phosphate section, which was not so badly frosted. Particulars in Table II.

WARRNAMBOOL PLOTS.

Variety Tests Without Manure.

PLOT No. 1.—EARLY VARIETIES.

A *one-acre plot was planted on* 13th to 18th July, half with Carman and half with Brownell's Beauty. The former gave a return of 4 tons 10 cwt. per acre, and the latter 3 tons 16 cwt. 84 lbs.

Plot No. 2 comprised six varieties, early and mid-season. The returns from these may be regarded as satisfactory. See Tables III. and IV.

WAUBRA PLOT.

This plot, which was unmanured, was planted under the grass sod, virgin land. Owing to the delay in planting this plot, there was a large percentage of misses, ranging from 10 per cent. to 40 per cent. The actual yields obtained are no indication of the possible returns from the land, nor the yielding capacity of the respective varieties. In the returns for this plot, Table V., allowance is made for the percentage of *misses*.

PORT FAIRY PLOT.

This plot was established on Mr. Malcolm's farm, Glen Oak, to test the effect of artificial manures on the potato crop.

The soil was very old peat, characteristic of the peat beds which abound among the basalt ridges in this district. Before operations were commenced, or the scheme of manuring was decided on, the soil was analyzed. The analysis disclosed the fact that it was very deficient in potash and phosphoric acid, but was very rich in nitrogen, lime, and magnesia. See Table VI. This indicated the need for a dressing of potash and phosphoric acid, which was supplied by a maximum and minimum dressing. The use of superphosphate and sulphate of potash, used separately, and combined in the minimum dressing, was 2 cwt. superphosphate, 1 cwt. potash sulphate; maximum, 4 cwt. superphosphate, 1½ cwt. potash sulphate. See Table VIA. The plot, which was one acre in extent, was divided into two parts, and containing five sections one-tenth of an acre each. The crop showed in a very marked manner the effect of the manures during the whole growing period—the most vigorous growth was on the sections receiving a dressing of superphosphate either alone or in combination with potash. On the 9th January all these superphosphate sections showed a ripening of the foliage of the plants; this was more pronounced in the seed receiving *superphosphate alone, than in those with superphosphate and potash*; whilst the unmanured and potash sections did not lose their fresh green colour until the plants had completed their life period. This apparent ripening off was no doubt due to the action of the superphosphate. This fact is borne out by the large percentage of small tubers on the

section superphosphate only, as compared with the potash and unmanured sections.

No. 1. No manure. No. 2. Two cwt. superphosphate, 1 cwt. sulphate of potash. No. 3. One cwt. sulphate of potash. Small bags in front represent quantity of small tubers in each section.

No. 4. Two cwt. of superphosphate. No. 5. Four cwt. superphosphate, 1½ cwt. sulphate of potash. Small bags in front represent quantity of small tubers in each section.

A marked feature of the effect of the manures was evident in the growth of the plants in the unmanured section—the plants were small

and feeble looking. In all the sections receiving superphosphate, the *plants showed evidence of a very vigorous growth, and at digging were* prone on the ground; but in the case of the section potash only, the plants were medium sized, of even growth, standing erect, having ripened off with a nice golden colour, thus showing a better development of the woody structure of the plant. It is also claimed for potash that it makes the plant more resistant to disease.

The yield of the crop was influenced by the manures in a marked manner. See Table VII., which shows that the omission of potash in the dressing is attended with a marked reduction in the yield. These results are in accord with those obtained by George Ville, the celebrated French agricultural chemist, in his experiments when he found that the suppression of potash reduced the yields from 9 tons 16 cwt. to 4 tons 4 cwt. per acre. In division 2 of this plot the suppression of potash reduced the yield from 9 tons 15 cwt. to 4 tons 10 cwt.

The increase of yield was not the only noticeable feature. The appearance and evenness of the tubers on all the sections receiving potash was apparent.

That the quality of the tubers was improved by the manure dressing is evident by the starch content, which was increased from 12.96 in the unmanured, to 17.05 in the maximum dressing. This was in keeping with the cooking quality of the tubers, as will be seen on reference to Table VII.

With reference to the cooking test, it should be stated that the variety Snowflake is not calculated to give very high averages for flavour or mealiness. The latter condition was evidently improved by the dressing of superphosphate, as Nos. 2, 4, and 5 all scored the same points for mealiness, viz., 17; whilst sections 1 to 3 had only 15 points. In Table VI. will be found the soil analysis of this plot, and Table VI.A shows the plan of plot manures applied, Table VII. details of yield, analyses, and cooking tests.

IMMATURE v. RIPE SEED.

The prevailing opinion amongst growers regarding the condition the potato crop should be in when harvesting the tubers for seed is that the plants should be dead, or, as it is termed, quite ripe, and that the crop should not be lifted until a fall of rain has occurred. However, experiments for some years past in Great Britain show that seed dug in an immature state, while the plants are quite green, always give the most satisfactory yield.

In the seasons 1906-7 and 1907-8 tests were carried out in the departmental plots, with similar results. In 1909 a commencement was made to test the influence of constant growing from immature seed *versus* constant growing from ripe seed. Unfortunately, the outbreak of blight in the 1910-11 crop so marred the results that they were abandoned.

These experiments were resumed in 1912 by harvesting portion of a plot of Up-to-Dates and Carman:—A parcel of immature and ripe Carman seed was planted by Mr. Ricketts, of Bentleigh, in July, and harvested on the 18th December, 1912. The ripe seed returned 3 tons 1 cwt. 12 lbs., the immature seed 4 tons 1 cwt., being an increase of 1 ton

per acre in favour of immature seed. The sample of the latter was much superior to the ripe seed.

A field plot at Romsey planted with Up-to-Dates gave the following results (planted 9/12/12, dug May, 1913):—

	Tons	cwt.	lbs.
Immature Seed	6	8	64
Ripe seed	3	17	104
	2	10	72

Field plot, Carman, Romsey—

Immature seed	5	5	60
Ripe Seed	2	17	80
	2	7	92

In the above experiments it will be noted that the increase is considerably over 2 tons per acre; and it should be stated that in both varieties the produce from the immature seed was a much finer sample than from the ripe seed.

In the above experiments seed was taken at various stages of growth, and it was found that those in the most immature conditions produced strongest buds, the most vigorous plants, and the heaviest crop.

Some striking results were obtained from a crop of Up-to-Dates treated in the above manner. No. 1.—One drill was lifted in January, 1913; the plants at this date were quite green, and the skin on the tubers was easily rubbed off. No. 2.—The next drill was allowed to remain in the ground until the plants were quite dead, and these were lifted in May. Planting time, in October, they were examined and tested for germinating power. No. 1 produced 95 per cent. of vigorous buds; No. 2 had only 9.09 per cent. of vigorous buds. These results are very remarkable.

IMPORTED VARIETIES OF POTATOES.

PLANTED AT ROMSEY.

Five parcels of British and two French first early varieties were imported, with a view to supplying the market growers in the early district with a first early market variety. The seed, which was shipped in cool chamber, arrived in splendid condition, and was planted at Romsey on 11th November, 1912. The germination was all that could be desired. The crop was harvested on 24th May, 1913. The yields and cooking qualities will be found in Table VIII.

The British varieties were as follow:—Epicure, round, white, vigorous grower, and good cropper; May Queen, first early kidney, very small plant, fine tubers; Midlothian, early, plants irregular; Ninetyfold, large white, kidney-shaped tubers, vigorous plants, fine tubers; Sharp's Express, true kidney, very vigorous plants.

The French varieties were—Belle de Juillet, kidney; and Eiffel, white, oval tubers.

It will be noted that Midlothian Early gave the poorest yield. Many of the plants were very small, and the germination not so satisfactory as in the other sorts. The next lowest yield was Belle de Juillet. The

[*Continued on page* 138.

TABLE I.

Leongatha Plot.

Name of Variety.	224 lbs. Superphosphate, Per Acre.						No Manure.						265 lbs. Thomas' Phosphate, Per Acre.					
	Market.			Small.			Market.			Small.			Market.			Small.		
	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.
Clarke's Main Crop ..	1	6	28	0	9	42	0	17	56	0	12	56	1	6	98	0	9	42
Early Norther ..	3	9	42	0	13	84	2	17	56	0	12	56	3	1	98	0	15	70
Cruffle	1	11	28	0	15	70	0	17	56	0	12	56	1	17	56	0	16	28
Burbank	2	3	14	1	2	56	2	0	0	0	15	0	1	18	14	0	13	84
State of Maine ..	3	9	2	0	6	98	2	12	56	0	17	56	2	19	2	0	6	98
Sutton's Abundance	2	10	70	0	14	42	1	15	0	0	12	56	1	16	98	0	11	84
Early Fortune ..	2	11	28	0	14	42	1	7	56	0	17	56	2	0	70	0	10	70
Aderondack ..	1	11	98	0	8	84	0	17	56	0	10	0	0	17	56	0	8	84
Chancellor ..	1	14	42	0	10	0	1	2	56	0	7	56	0	16	98	0	4	42
Up-to-date ..	1	5	0	0	10	0	0	7	56	0	7	56	1	18	14	0	6	98
Snowflake ..	2	6	98	0	3	14	1	5	0	0	7	56	3	6	28	0	4	42
Fox's Seedling ..	1	15	70	0	10	70	1	7	56	0	10	0	1	9	42	0	8	84
Wilson's *Premiers* ..	1	13	14	0	10	70	1	5	0	0	12	56	1	6	98	0	8	84
Commersoni Violet	0	16	28	0	3	14	0	7	56	0	3	0	0	13	14	0	3	84
Average ..	2	0	32	0	10	105	1	7	16	0	11	32	1	16	40	0	9	30

TABLE II.

Alberton Plot.

Variety.	*Superphosphate.*						*No Manure.*						Thomas' Phosphate.						*No Manure.*					
	Market.			Small.			Market.			Small.			Market.			Small.			Market.			Small.		
	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.	Tons	Cwt.	Lbs.
Brown's River ..	4	1	28	0	11	28	4	0	0	0	15	0	5	5	28	0	8	84	5	5	0	0	12	56
Clarke's Main Crop	4	5	0	0	8	84	3	10	0	0	12	56	5	1	28	0	6	28	6	5	0	0	7	56
Sutton's Abundance ..	3	16	28	0	11	28	3	15	0	0	7	56	4	13	84	0	8	84	5	11	28	0	10	0
Foxes' Seedling ..	3	10	0	0	8	84	2	10	0	0	5	0	4	2	56	0	8	84	5	17	56	0	10	0
Wilson's Premiers	7	11	28	1	5	0	4	7	56	1	5	0	8	15	0	1	6	28	10	0	0	1	0	0
Black Prince ..	4	3	84	1	10	0	3	10	0	1	10	0	4	10	0	1	10	0	5	12	56	1	15	0
Old Pink Eye ..	3	2	56	1	6	28	2	10	0	1	6	28	5	10	0	1	5	0	7	0	0	1	0	0
State of Maine ..	4	3	84	0	15	0	2	10	0	0	15	0	4	17	56	0	18	84	6	10	0	1	2	56
Commersoni Violet	2	17	56	0	7	56	3	15	0	0	7	56	4	10	0	0	11	28	6	0	0	0	12	28
Early Norther ..	4	2	56	0	12	56	3	10	0	0	15	0	4	2	56	0	11	28	5	15	0	0	17	56
Early Fortune ..	4	0	0	0	10	0	3	5	0	0	7	56	5	0	0	0	11	28	5	15	0	0	15	0
Aderondack ..	3	15	0	0	10	0	3	0	0	0	7	56	4	11	84	0	12	56	3	10	0	0	7	56
Copperskin ..	3	12	56	0	13	84	2	15	0	0	10	0	4	8	84	1	10	0	4	7	56	1	10	0
Averages ..	4	1	71	0	14	69	3	5	103	0	14	15	5	0	71	0	16	6	5	19	15	0	16	101

TABLE III.

Experimental Plots 1912-13.

Messrs. Callaghan Bros., Woolaston, Warrnambool.

Plot No. 1—Planted 16th, 17th, 18th June, 1912.
Harvested 18th December, 1912.

Varieties.	Tons	cwt.	lbs.
31 rows Carman No. 1	4	10	0
37 rows Brownell's Beauty	3	16	3
New Zealand Pink Eye	3	17	56

TABLE IV.

Plot No. 2—Planted 28th and 29th August, 1912.
Harvested 5th February, 1913.

Varieties.	Tons.	cwt.	lbs.
Clarke's Main Crop	7	0	0
Early Fortune	7	6	59
Sutton's Abundance	7	4	59
Black Prince	7	0	0
Chancellor	6	5	0*
Early Norther	8	4	64
Cruffle	8	5	32

* Inferior quality.

TABLE V.

Results of Experimental Plot of Potatoes planted at Ercildoune Station, Waubra.

Name of Variety.	No. of Rows.	Percentage of Misses.	Tons	cwt.	lbs.
		%			
Carman	9	40	6	17	0
Wilson's Premiers	2	10	9	18	56
Chancellor	1	40	5	4	56
Clarke's Main Crop	4	30	6	9	0
Black Prince	2	10	7	18	84
Early Norther	2	30	7	0	0
Burbank	1	40	6	18	56
State of Maine	1	30	4	12	56
Cruffle	1	20	10	5	84

TABLE VI.

Soil Analysis, Port Fairy Plot.

—	Soil to 6 ins.	Subsoil, 14 in.
Nitrogen	1,806 per 100,000	1,358 per 100,000
Phosphoric Acid	31	24 .. ..
Potash	61	16 .. ..
Lime	2,844	2,494 .. ..
Magnesia	815	752 .. ..
Chlorine	80	82 .. ..

Division I.	1	2	3	4	5
	Tons cwt. lbs. 4 16 28	Tons cwt. lbs. 9 5 34	Tons cwt. lbs. 9 4 74	Tons cwt. lbs. 6 1 58	Tons cwt. lbs. 11 7 66
	No Manure.	2 cwt. Superphosphate. 1 cwt. Sulphate of Potash.	1 cwt. Sulphate of Potash.	2 cwt. Superphosphate.	4 cwt. Superphosphate 1½ cwt. Sulphate of Potash

TABLE VIA.

Plan of Manure Plot, Port Fairy.

Mr. Malcolm's Farm.

DIVISION I.		DIVISION II.
5. 4 cwt. Superphosphate, 45 lbs. 1½ cwt. Potash Sulphate, 17 lbs.		1. No manure.
4. 1 cwt. Potash Sulphate, 11¼ lbs.		2. 2 cwt. Superphosphate, 22½ lbs.
3. 2 cwt. Superphosphate, 22½ lbs.		3. 2 cwt. Superphosphate, 22½ lbs. 1 cwt. Potash Suplhate, 11¼ lbs.
2. 2 cwt. Superphosphate, 22½ lbs. 1 cwt. Potash Sulphate, 11¼ lbs.		4. 1 cwt. Potash Sulphate, 11¼ lbs.
1. No manure.	2 ft.	5. 4 cwt. Superphosphate, 45 lbs. 1½ cwt. Potash Sulphate, 17 lbs.

TABLE VII.

—	Manure.	Cost per Acre. s.	Cost per Acre. d.	Yield. Tons	Yield. Cwt.	Yield. Lbs.	Gain. Tons	Gain. Cwt.	Gain. Lbs.	Per Cent. Small.	Starch Content.	Cooking Test. Flavour.	Cooking Test. Mealiness.	Cooking Test. Whiteness.	Cooking Test. Total.
Division I.—		s.	d.							%					
Section No. 1	No manure	..		4	16	28	0	0	0	12	12·96	35	15	18	68
Section No. 2	2 cwt. Superphosphate, 1 cwt. Potash	23	4	0	5	34	4	9	6	11·9	14·60	43	17	20	80
Section No. 3	1 cwt. Potash Sulphate..	14	7½	9	4	74	4	8	56	5·3	14·60	40	15	18	73
Section No. 4	2 cwt. Superphosphate	8	9	6	1	58	1	5	30	41·8	14·71	42	17	20	79
Section No. 5	4 cwt. Superphosphate, 1½ cwt. Potash Sulphate ..	39	5	11	7	66	6	10	38	14	17·05	45	17	20	83
Division II.—															
Section No. 1	No manure	..		4	10	60	0	0	0	11·6					
Section No. 2	2 cwts. Superphosphate .., 1 cwt. Potash Sulphate	23	4½	7	8	36	2	17	88	15·4					
Section No. 3	2 cwt. Superphosphate	8	9	6	17	16	2	6	68	30·9					
Section No. 4	1 cwt. Potash Sulphate..	14	7½	9	15	52	5	4	104	7·4					
Section No. 5	4 cwt. Superphosphate .., 1½ cwt. Potash Sulphate ..	39	5	9	5	100	4	15	40	24·8					

Analysis and cooking tests were from tubers of both divisions.

TABLE VIII.

Results of Imported Seed planted at Romsey.

Name of Variety.	Yield Per Acre. Market. Tons	Market. Cwt.	Market. Lbs.	Small. Tons	Small. Cwt.	Small. Lbs.	Cooking Test. Flavour.	Mealiness.	Whiteness.	Total.	Remarks.
Midlothian Early ..	1	4	102	0	9	42	40	25	18	80	Tubers irregular; flesh yellow
Eiffel	2	16	58	0	10	110	50	30	18	98	Fine quality; netted skin
Epicure	3	5	110	0	11	28	30	40	20	90	Tubers round; good appearance
May Queen ..	3	0	60	0	10	5	47	30	15	92	Very small plants; tubers large; very early
Ninety-fold ..	4	4	12	0	9	54	45	20	20	85	Fine tubers; cooking test fair
Belle de Juillet ..	2	7	16	0	14	52	35	25	12	72	Very irregular; flesh yellow
Sharp's Express ..	4	14	2	1	2	86	50	30	15	95	Good cropper; flesh yellow
											Further cooking tests needed

germination of this variety was satisfactory; the plants, however, were very small and weak, and the tubers undersized, with very yellow flesh. The other French variety, although the yield was low, has many features to recommend it. It produces very few small tubers, flesh very white, a good cooker. The best yields were obtained from Sharp's Express and Ninetyfold. The former is a very vigorous grower, heavy cropper, and should prove a useful sort for market gardeners. Ninetyfold produces a large kidney-shaped tuber of very attractive appearance, and good cooking quality. The next in point of yield Epicure, a very vigorous grower, produced fine bold tubers, and should prove a useful sort in heavy soils. The yields and cooking tests will be found in Table VIII.

Four 14-lb. parcels, including some of Sutton and Sons' latest productions, were forwarded for trial. They were as follow:—Windsor Castle, Balmoral Castle, Suttons' Acquisition, and Suttons' Harbinger. The first-named is an old favourite, and was grown in this State more than twenty years ago by Mr. John Roberts, of Warragul. Balmoral Castle is a large, round tuber, yellow skin and flesh. There were no striking features in either of the other sorts.

Cow Milk *v.* Reindeer Milk—

The richest of all natural milks used for human food is, without question, the milk of the reindeer.

Reindeer milk has the following composition:—

Total solids	37.40-38.10
Fat	20.95-28.27
Protein	9.70-11.18
Milk sugar	2.80- 6.00
Ash	1.31- 1.52

The following may be taken as the average composition of the milk of the cow:—

Total solids	12.80
Fat	3.90
Protein (casein albumen)	3.40
Milk sugar	4.75
Ash	.75

A comparison of these analyses shows the milk of the reindeer to contain, approximately, three times the quantity of total solids and six times the quantity of fat contained in the cow's milk.

The physiological reasons for this is that animals inhabiting regions in high latitudes require foods very rich in heat units, in order to bear the extreme winter cold.

Reindeer milk when freshly drawn is so thick and creamy in its consistency that it is regarded by the Lapps as too thick for direct use, so they dilute it with two or three times its volume of water.—*Pure Products*, November, 1913, and Henry Droop Richmond.

THE TYROLEAN FRUIT CASE.

A GERMAN METHOD OF PACKING APPLES.

By J. G. Turner, Chief Horticultural Officer.

About the 11th October last, a cablegram appeared in the daily press, which read as follows:—

AUSTRALIAN FRUIT.

German Market.

Packing Methods Criticised.

Herr Henoch, of Berlin, in a report to the Commonwealth Government, states that the importation of Australian apples and pears into Germany is greatly prejudiced, because the fruit is wrongly packed. Merchants who re-pack the fruit in a looser and more attractive way were making 25 per cent. additional profit owing to the alteration. The fruit marketed in Germany is rapidly extending, and is attracting buyers from Russia, Scandinavia, and adjacent countries. Herr Henoch offers to forward sample cases to Australia packed in the German style, should the fruit-growers wish it.

Immediately after the appearance of this cable a suggestion was made by me that the matter be brought under the notice of the Agent-General, with a request that sample cases be obtained by him and for-

warded to this Department, if possible, before the end of January, 1914, with a view to exhibiting the goods and system of packing to exporters and others desirous of seeing them. In the meantime the Commonwealth Department for External Affairs had also made arrangements

for sample cases to be sent to the various States. The sample cases were sent out by the s.s. *Seydlitz*, and landed here on the 7th January last.

By the courtesy of the Minister for External Affairs, one of the sample cases was placed at the disposal of the Department of Agriculture, with a view to arranging that those interested would take the

opportunity of seeing the method for themselves. Accordingly, on the morning of Tuesday, 20th January last, the case was opened at the Government Cool Stores in the presence of the Minister for Agriculture, the Director for Agriculture, and 40 or 50 gentlemen interested in the industry.

The case containing the fruit was constructed of spruce, and bound round by willow strips at each end. When opened, the contents

presented rather a gaudy appearance, as the case contained a large amount of paper shavings of various colours. A layer of these shavings, one inch in thickness, had been placed between each layer of fruit, and also at the top and bottom. In addition to this, wood-wool and a padding somewhat resembling tough cotton wool had been placed at the top and sides. The fruit (apples) was contained within double wrappers of tissue paper, and each layer numbered 60 fruits. These layers were six deep, making a total of 360 fruits. The dimensions of the case were:—Inside, 32 inches long, 14½ inches wide, and 15¼ inches deep, or a cubical content of 7,067.95 cubic inches. The outside measurements were 34 inches long, 16 inches wide, 17 inches deep, or a cubical dimension of 9,248 inches. The case, therefore, should contain slightly more than three times the amount of the present bushel case in use; but, owing to the great amount of padding it contained, the contents were considerably less, as shown above.

The large bulk of the case was regarded by many of those present as excessive, and its use here would make it a cause for complaint by stevedores and others concerned. The large amount of fruit contained in the case, it was thought, would cause great risk of bruising to the lower tiers of fruit. The size, shape, and cubical content, moreover, did not readily lend themselves to the application of the numerical and capacity standards as required, for instance, for fruit shipped to America and Canada. The excessive amount of wood-wool and wrapping-paper contained in the case, judging by previous experience, would be made a matter of strong objection by purchasers in the United Kingdom and on the Continent.

Prominent exporters voiced the opinion that, on the whole, the case had little to recommend its adoption. To this, however, the officials present pointed out that the case had evidently been made the subject of great care and attention by the gentleman who had forwarded it, and it would be premature to condemn it without further report, from Germany, as to its virtues. One of the first principles of the trade was that of adapting oneself to the buyers' wishes, and to supply our markets with goods put up in the style and method asked for by the man at the other end. Accordingly, it would be unwise to ignore the wishes of the German people if they wanted fruit put up in this style. It is in this connexion that the German and Americans have accomplished continuous and consistent success. They want to know, and carefully note, what their customers want, and let them have it. We should do the same here; but before doing so we must be satisfied that the sample shown is the right one. So far, those officials and exporters who have visited the Continent have not heard of any demand for such a system of packing as the one referred to, and they do not consider it advisable to alter the present export case until further and more convincing information is forthcoming.

RUTHERGLEN EXPERIMENT FARM.

REPORT ON PERMANENT EXPERIMENT FIELD, SEASON 1913.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

I.—INTRODUCTION.

The Rutherglen Viticultural College reserve comprises 980 acres of land, of which some 60 acres have been planted with phylloxera-resistant mother stocks, and 20 acres (at Wahgunyah) have been devoted to nursery work for the propagation of phylloxera-resistant rootlings. Of the remainder, approximately 750 acres are available for general farming.

The Rutherglen Viticultural Station has been of great assistance to the viticultural industry of the State by distributing each year large numbers of grafted vines for the reconstitution of phylloxera-infested vineyards.

In 1912 it was decided to still further increase the usefulness of the institution by utilizing the grazing area as an Experiment Farm for the prosecution of systematic researches and experiments in agriculture.

It was felt that the method of conducting experimental work at that time—*i.e.*, by the utilization of a large number of plots on private farms—was cumbersome and inconclusive. The range of the work on these plots was practically confined to variety and manurial tests. Experiments demanding constant supervision, and involving considerable departures from orthodox practice, *e.g.*, feeding tests, rotation trials, cultural and tillage trials, and cereal improvement, are beyond the scope of the average farm. Moreover, experimental work in the field is of little value unless it is permanent in character, and conducted for such a length of time as to eliminate the error effect of season and climate. In a word, most field experiments, to have any value at all, need to be permanent in character, and the great value of such experiments as those of Rothamsted, which have profoundly influenced agricultural science and practice throughout the world, lies in the fact that they have been conducted uninterruptedly for over 70 years.

Permanent trials of the character indicated above are hardly possible on private farms. For these reasons it was decided to concentrate the experimental work hitherto conducted on some 60 or 70 private farms, in a few selected centres in each of the climatically different districts of the State. Accordingly, Rutherglen was selected as a district farm for the north-east.

While it is true that the principles of agriculture are the same all over the world, it is equally true that the practice based on these principles is fundamentally different in Australia from that of the Northern Hemisphere, on account of the differences in soil, climate, and economic conditions. Because the climatic, soil, and economic conditions differ so widely from those that obtain in the Old World, many of the practices which have proved successful under European conditions are found to be quite unsuitable here.

The evolution of successful systems of agriculture in Europe has been rendered possible by the accumulated experience and tradition of many centuries. There is no such rich store of experience and tradition to draw upon in a new country like Australia. The evolution of permanently profitable systems of agriculture in each of the soil provinces of Australia must, therefore, be materially assisted by the carrying out of systematic permanent experimental work in each such province.

The primary purpose of the Rutherglen Experiment Farm is not to attain financially profitable results so far as the farm itself is concerned, but to assist the agricultural practice of the North-Eastern portion of the State by the prosecution of investigations and trials under practical and accurately-recorded conditions concerning the problems involved in increasing the agricultural output of the State, particularly as regards—

(1) Improvement of wheat and other cereals, and economic plants by selection, stud-breeding, and hybridizing.
(2) Soil renovation, soil fertilization, and tillage methods.
(3) Rotation of crops and improved cropping practices.
(4) Improvement of natural pastures.
(5) Research concerning soil moisture, soil temperatures, and biological conditions, and the nutrition of plants.
(6) Meteorological observations relating to agriculture.

In order to secure conclusive results from field experiments, it is very essential that the soil on which the experiments are conducted should be as uniform in character as possible. If the soil on which any given experiment is conducted varies considerably from point to point many years must elapse before the results from differential soil treatments become manifest, and an elaborate scheme of check plots to counteract variations becomes necessary.

PERMANENT EXPERIMENT FIELD.

The permanent experiment field comprises an area of 105 acres, subdivided into plots varying in size from one-twentieth to half-an-acre, according to the nature of the investigation in progress. This area has the advantage of being fairly uniform in character and surrounded on three sides by main roads. Moreover, the soil is naturally poor, as may be judged from the nature of the natural herbage and from the chemical composition of the soil. For these reasons it is well suited for the conduct of experimental work.

NATURE OF THE SOIL.

Some idea of the nature of the soil may be obtained by considering the chemical and mechanical analysis of representative samples of the soil and subsoil.

Five separate sets of samples were taken at intervals of 7½ chains along the middle line of the Permanent Field. To the eye practically no differences were discernible in the various samples. The change in colour from soil to subsoil ranged from 5½ to 7 inches deep. The soils consisted of greyish clay loams resting on yellowish retentive clay subsoils. A chemical examination of these five sets of samples revealed

deficiencies in each of the principal elements of nutrition. Table I. summarizes the results.

TABLE I.

SHOWING AMOUNT OF THE PRINCIPAL PLANT FOODS IN SOILS OF PERMANENT EXPERIMENT FIELD.

SOILS.

—	Nitrogen.	Phos. Acid.	Potash.	Lime.	Reaction.
	Per cent.	Per cent.	Per cent.	Per cent.	
Sample No. 1 ...	·073	·028	·092	·190	Neutral.
2 ...	·061	·025	·090	·158	Slightly acid.
3 ...	·061	·028	·142	·162	Neutral.
4 ...	·061	·023	·115	·128	"
5 ...	·061	·025	·124	·152	Slightly acid.
Average of 5 Soils...	**·063**	**·026**	**·112**	**·158**	

SUB-SOILS.

Sample No 1A ...	·022	·018	·134	·144	Neutral.
2A ...	·022	·018	·141	·138	Slightly acid.
3A ...	·025	·025	·195	·270	Neutral.
4A ...	·031	·024	·163	·196	"
5A ...	·036	·024	·210	·144	Slightly acid
Average of 5 Sub-soils	**·027**	**·022**	**·169**	**·198**	

The amounts of nitrogen, phosphoric acid, potash, and lime in the soils were, of course, determined after extraction of the soil with strong acid. As an inventory of the chief soil constituents present at the initiation of experimental work it is of considerable value. The analysis shows the soil's stock-in-trade, its permanent productive value, the amount of reserve plant food in the soil bank for ultimate utilization by future crops. Compared with arbitrary standards of fertility of good average European soils, these soils are deficient in nitrogen, lime, and potash, and extremely deficient in phosphoric acid. A good average soil might be expected to show on analysis, at least .1 per cent. nitrogen, .1 per cent. phosphoric acid, .2 per cent. potash, and from .5 per cent. to 2 per cent. of lime. From this it will be seen that the amount of nitrogen and potash is little more than half, and the phosphoric acid content is little more than one-quarter the amount found in a good average soil. As might have been expected, the nitrogen content of the second 6 inches .027 per cent. (subsoil) contains considerably less than that of the upper 6 inches (.063 per cent.). On the other hand, the amount of potash and lime in the subsoil considerably exceeds that of

the surface soil, whilst the phosphoric acid content almost equals that of the soil.

The figures given above are of interest in so far as they indicate the total amount of reserves in the soil which may ultimately become unlocked and made available for the use of future crops. They do not indicate, however, the amount of these essential plant foods immediately available for the use of present crops. Some rough idea of the amount of immediately available plant food in the soil may be obtained by treating it with a dilute acid of a strength approximating that of the root sap. It is usual to determine this by using a 1 per cent. solution of citric acid for soil extraction. The following table indicates the amount of phosphoric acid and potash obtained by extraction with dilute citric acid.

TABLE II.

AMOUNT OF "AVAILABLE" PHOSPHORIC ACID AND POTASH IN RUTHERGLEN SOIL.

SOIL.

—	Phosphoric Acid.	Potash.
	per cent.	per cent.
Sample No. 1	·002	·0119
2	·003	·0102
3	·003	·0115
4	·0027	·0149
5	·0033	·0099
Average of 5 Samples ..	**·0028**	**·0117**

At a later stage it will be necessary to review in detail the movement of nitrates and other soluble salts within the body of the soil under varying systems of cultivation and at different seasons of the year. It need only be said, in passing, that though the nitrogen content of soil and subsoil is considerably less than the average content of good soil, the results of the permanent manurial plots seem to indicate that only a very limited call for nitrogenous manures exists at the present time. The explanation of this apparent anomaly will be considered in dealing with the results of the nitrification tests.

The soils and subsoils were next submitted to mechanical analysis, and the particles graded according to size. In this manner the sand, silt, and clay composing the greater bulk of the soil were separated and the relative proportions of each determined. The proportion in which each of these primary soil materials occurs determines to a large extent the tillable qualities of the soil. Table III. summarizes the mechanical composition of the soils.

The mechanical analysis at first sight appears to be very satisfactory, as it contains a good balance of clay, silt, and sand, and one would be inclined to expect that soils of such construction would be

friable and very amenable to cultural and tillage operations. As a matter of fact, however, these soils in practice are found to be far from easily worked. They run together badly with the rain, and set

TABLE III.

MECHANICAL COMPOSITION OF THE SOIL ON THE PERMANENT EXPERIMENT FIELD.

Sample No.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very fine Sand	Silt.	Fine Silt.	Clay.	Water.	Organic Matter.
Soils.										
1	0·80	2·00	1·30	6·75	35·90	17·65	6·25	25·15	1·32	2·88 (containing humus ·60 %)
2	0·75	2·45	1·40	6·35	38·55	11·05	13·05	22·00	1·50	2·90 .. .. ·59 %)
3	1·30	2·95	1·80	4·90	35·95	10·60	12·50	26·11	1·18	2·71 .. .. ·54 %)
4	1·00	3·35	2·00	5·95	33·15	12·65	12·60	23·23	3·36	2·76 .. .. ·50 %)
5	0·55	2·95	2·35	7·15	41·10	7·90	13·70	20·58	0·98	2·74 .. .. ·52 %)
Average five soils ..	0·88	2·74	1·77	6·23	36·93	11·96	11·62	23·41	1·67	2·80 .. ,, ·55 %)
Subsoils.										
1A ..	1·10	2·05	1·65	7·25	32·80	17·95	9·60	24·24	1·36	2·00
2A ..	1·30	2·00	1·55	6·60	37·80	11·75	10·15	25·45	1·40	2·00
3A ..	1·00	2·30	1·45	4·30	30·85	7·10	11·15	36·03	2·57	3·25
4A ..	2·00	3·10	1·55	4·50	30·80	6·55	11·95	31·98	4·80	2·77
5A ..	1·00	2·55	1·60	5·40	31·20	6·10	9·15	34·34	4·78	3·48
Average five sub-soils ..	1·28	2·40	1·56	5·61	32·69	9·88	10·40	30·49	2·98	2·70

No. 1 contains .. .. .. 7·0 per cent. stones
,, 2 .. .. 3·5 ,, ,,
,, 3 .. .. 3·0 ,, ,,
,, 1A .. .. 10·0 ,, ,,
,, 2A .. .. .. 3·0 ,, ,,
,, 3A .. .. 2·0 ,, ,,

extremely hard on drying. Ploughing operations are only possible when the surface is thoroughly moist. The tendency to puddle when wet and to set like cement when dry is most probably the result of a shortage of carbonate of lime and organic matter in the soil. Thus typical black soils of the Wimmera contain more than twice the percentage of clay particles found in the Rutherglen soil, and yet they present no special difficulties in working. Many of the soils, in fact, may be ploughed with ease at any period of the year. This is one reason why "*summer fallowing,*" *i.e., ploughing in January and* February is so common in the Wimmera. The black soils crumble on drying, and form a sort of loose soil mulch, which renders ploughing operations easy. This peculiar crumbling character is undoubtedly due to the high lime content of the Wimmera soils and the comparatively high content of organic matter, for both these factors have a determining influence on the physical condition and texture of any soil. Thus, a representative number of black and red Wimmera soils revealed on analysis 6.13 per cent. of organic matter, 1.395 per cent. of humus, and 1.38 per cent. of lime. On the other hand, the average content of these five Rutherglen soils show but 2.80 per cent. of organic matter, .55 per cent. of humus, and only .158 per cent. of lime. With this chemical and mechanial analysis in mind, it will be of interest to study at a later stage the results of the manurial and fertilizer trials and tillage tests.

THE SEASON.

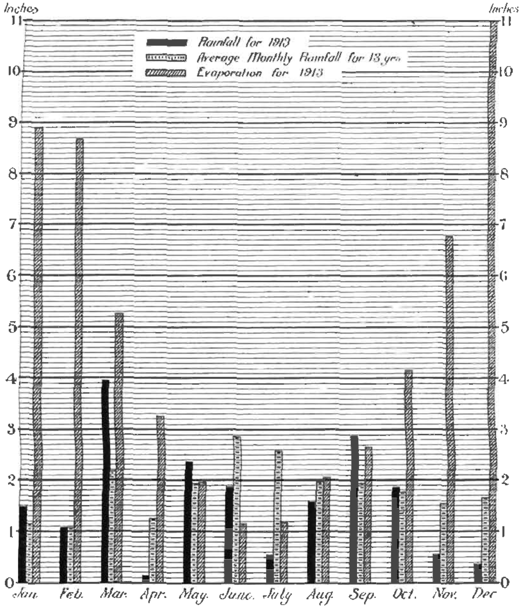
In interpreting the results of any given set of experiments for the year, a study of the seasonal conditions is of considerable importance. The rainfall for the year was 18.53 inches, 3 inches less than the average rainfall for the past thirteen years. On the whole, the seasonal distribution was good. The autumn rains were copious, thus insuring a vigorous growth of grass and giving favorable conditions for the sowing of green forages. The winter months—June, July, and August—were extremely dry. Spring was ushered in with nice falls in September and October, but the hot, dry weather in November and December arrested the full development of the crops, and ultimately led to yields considerably below pre-harvest expectations.

Fig. 1.—Apparatus for taking Meteorological observations and soil temperatures, Rutherglen Experiment Farm.

The amount of evaporation is an important factor in determining the effectiveness of the rainfall. Many light showers are often nullified by the drying effect of the high winds following the rain. The amount of evaporation has been measured daily at Rutherglen with a standard evaporating tank. The evaporation so recorded, it must be understood, is the amount of water evaporated from a free water surface, and not the amount of moisture evaporated from the soil. This explains why the amount lost by evaporation is practically three times as much as the rainfall. The evaporation for 1913 was 54.92 inches; and it may be assumed that if a dam were full on 1st January, 1913, the water level would fall 4 ft. 7 in. during the year solely through evaporation.

The monthly rainfall for 1913, the average rainfall for the past thirteen years, and the monthly evaporation for 1913 are summarized

in graphical form in Figure 2. It will be noted that the columns representing the evaporation form a more or less regular curve, falling to a minimum in June, and rising to a maximum in December. Incidentally, it may be noted that at Rutherglen the evaporation is least when the normal rainfall is greatest, and greatest during the periods of low rainfall.



RUTHERGLEN EXPERIMENT FARM

RAINFALL & EVAPORATION CHART 1913

Fig. 2.

It will be noted that the only months in which the rainfall exceeded the evaporation during 1913 were May, June, and September. These figures incidentally explain the necessity for the rapid restoration of the soil mulch by suitable implements after any substantial rains falling outside the wheat-growing period.

One of the most important factors in determining the rapidity of plant growth is the temperature of the soil. Not only is a sufficient soil temperature essential for germination and growth, but those innumerable chemical, physical, and biological changes in the soil which are so essential for the production of a sufficient food supply for the plant are absolutely dependent on temperature. That the temperature of the soil is a limiting factor in determining the rapidity of plant growth is made manifest in many ways. In the first place, no germination or growth is possible below a certain temperature, which varies, of course, with the nature of the plant. Thus, below 41 degrees Fahrenheit the life of a plant is practically suspended. Cereals, such as wheat, barley, and oats will certainly germinate at 41° Fah., but with extreme slowness. The rapidity of germination and growth increases up to a temperature of 77-88° Fah., when growth is at an optimum. Above this temperature the growth gradually falls off until a superior limit is reached at which growth ceases. On the other hand, the minimum temperature for the germination of maize is 49° Fah., and for plants like the melon and cucumber, 60-65° Fah. These plants make their best development with a soil temperature of 91° and 94° respectively.

The practical bearing of these facts is obvious. If the soil temperature falls near the minimum requisite for germination, the germination may be so protracted and so irregular that the young plant is likely to succumb. In our wheat areas in normal seasons the vigour and stooling capacity of late-sown wheat is always markedly less than the early-sown seed, and increased quantities of seed are invariably applied to counteract this decreased germinating capacity and stooling activity as seeding progresses. This decreased activity is due to the fact that the average temperature near the soil surface falls to the minimum for growth during the latter portion of the seeding season. Again, the sowing of certain seeds, such as maize, cow pease, soy beans, sorghum, &c., should be deferred until the summer sun has warmed the body of the soil to such an extent as to render possible rapid germination and subsequent rapid growth of the young plant. The low soil temperatures during October and the first half of November, 1913, was largely responsible for the irregular and patchy growth of early-sown maize and sorghum in the northern areas.

That the temperature of the soil should have an important bearing on the welfare of the plants, apart altogether from the facts mentioned above, will be apparent from other considerations. The temperature of a soil exercises a controlling influence on its productive power inasmuch as it profoundly affects the chemical, physical, and biological functions of the soil. Temperature accelerates chemical changes, increases the solvent power of soil moisture, hastens the oxidation of organic matter, and the breaking down of mineral matter, and thus leads to rapid production of soluble plant food. It also increases the osmotic pressure of the soil solution, and thus enables this soluble plant food to be rapidly taken in by the plant and transported through the tissues to the leaves.

A striking instance of the effect of temperature on the osmotic pressure was demonstrated by Sachs. Sachs has shown that both the tobacco and the pumpkin wilted at night, though the soil was provided with an

abundance of moisture, as soon as the soil temperature reached 55° Fah. At this temperature the pressure which moved the soil water through the roots to the leaves was insufficient to make up for even the *slow transpiration that takes place at night.*

Finally, the activity of the micro-organisms of the soil is dependent on the temperature. It has been repeatedly shown in this journal that one of the reasons why nitrogenous manures are ineffective in the Victorian wheat areas is the extreme activity of the nitrifying bacteria in our well-worked fallows during the warm summer months.

In view of these various facts, it is desirable that an effort should be made to secure systematic information on soil tmperatures on the permanent experiment field, especially as this phase of work has not hitherto received much attention in Australia.

A commencement was made by taking the maximum and minimum temperatures of the soil at a depth of 1 inch, 6 inches, 12 inches, and 24 inches daily throughout the year. For this purpose a pit 5 feet x 3 feet, and 2½ feet deep, was excavated, lined with cement, and covered with a trap-door. (Fig. 1.) Tubes 2 inches in diameter and 2 ft. 6 in. long were inserted horizontally through the cement facing on the eastern side of the pit. The thermometers, securely framed in light pine-wood receptacles, were then placed into the iron tubes, the orifice of which was kept corked. Readings were taken at 7 a.m. daily throughout the year. The following Table IV. summarizes the monthly maximum and minimum temperatures of air and soil for 1913:—

TABLE IV.

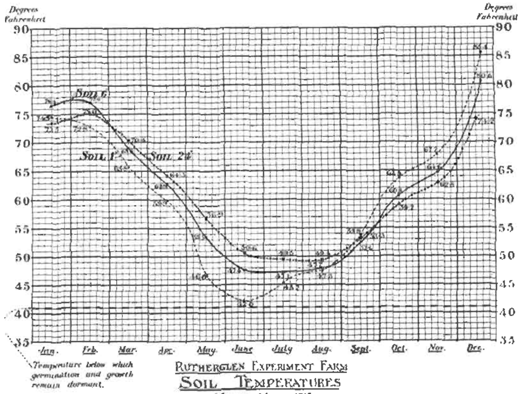
SUMMARISING MONTHLY EVAPORATION AND MEAN MONTHLY SOIL AND AIR TEMPERATURES.

—	Total Rainfall (Inches).	Total Evaporation (Inches).	Air Temperatures.		Soil Temperatures.							
			Maximum.	Minimum.	At 1".		At 6".		At 12".		At 24".	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
January	1·48	7·900	86·4	55·6	84·0	65·1	79·1	73·7	75·5	74·2	74·1	72·9
February	1·09	7·670	89·8	57·6	84·9	60·7	80·0	74·1	77·1	75·4	75·6	74·4
March	3·95	5·225	76·6	54·4	72·9	58·8	71·6	66·4	71·0	68·9	71·1	69·8
April	0·11	3·225	75·7	43·1	67·5	52·4	65·1	60·8	64·2	62·6	64·7	63·9
May	2·35	1·975	61·9	37·9	52·3	41·0	54·7	51·9	55·4	53·8	57·2	56·6
June	1·87	1·155	55·5	33·6	45·8	38·2	48·7	46·1	49·2	47·8	51·0	50·3
July	0·53	1·190	56·5	35·4	50·5	39·9	48·8	45·5	48·4	46·1	50·0	49·1
August	1·58	2·036	58·0	34·6	52·4	42·6	49·7	45·7	48·9	45·2	50·1	48·7
September ..	2·88	2·631	61·8	40·4	58·4	49·3	54·8	50·4	53·8	51·6	54·3	52·4
October	1·83	4·135	71·3	44·7	71·6	56·2	63·7	57·9	61·2	58·8	60·7	57·8
November	0·51	6·770	74·9	44·0	77·3	58·2	68·4	60·8	65·2	61·9	64·3	61·4
December ..	0·34	11 01	88·8	54·3	97·9	72·9	85·4	75·8	80·2	76·1	75·9	72·6
Whole year ..	18·52	54·92	71·4	44·6	68·0	52·9	65·0	59·1	62·6	60·2	62·4	60·8

The range of temperature will become more clearly demonstrated to the eye if the monthly average temperatures are plotted in graphical form. Fig. 3 shows such a graph.

An examination of these graphs exhibits several interesting features. In the first place, it will be seen that the variations in temperatures diminish with the depth. The greatest range of temperature is exhibited

at 1 inch below the surface. At this depth the average temperature for December was 85° 4′, whilst in June the monthly average fell as low as 42° Fah. The figures obtained at this depth may be regarded as fairly representative of the temperature to which seeds are subjected during the process of germination. On the other hand, the least variation is shown in the subsoil at a depth of 24 inches. At the lesser depth, the highest average temperature is in December, whilst the lowest is in August. The annual range of temperatures 24 inches deep is only 24° 89′ Fah., as against a range of 43° 4′ Fah, in the soil 1 inch deep. From the graph it will be noted that during the winter months the soil is very much warmer at the lower depths than it is near the surface, and that though the average temperature of the surface soil, during June approaches the limit below which plant growth is suspended, the temperature at the lower depths is always well



RUTHERGLEN EXPERIMENT FARM
SOIL TEMPERATURES
MONTHLY MEANS 1913

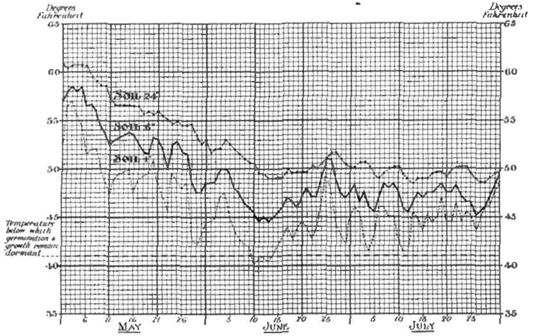
Fig. 3.

above this limit. This assists in explaining the remarkable root development made by early-sown wheats during the winter months, when the surface soil is frequently covered with hoar frost. It is well known that in normal seasons early-sown wheat crops invariably give better returns than the late-sown crops. The difference in overground development are often not very marked, but there can be little doubt that with the early-sown crop the underground development in the root system is far greater than with the late-sown crop, and to this must be ascribed the higher yields of the early crops—their remarkable capacity to withstand dry weather in spring. The high soil temperatures of April and May make this vigorous root development possible. The increased temperature of the soil in winter at the lower depths explains why it is that in districts like Rutherglen the bulk of the roots are never exposed to the unpleasantness of frosts.

From this graph it will be observed that during portion of the year the upper layer gives heat to, and for the rest of the year receives heat from the lower layer. As Dumont well says, "The soil seems to be a reservoir of heat from the day to the night, and from the summer to the winter."

On this graph a line has been drawn to indicate the temperature below which plant growth remains dormant.

It is a splendid testimony to our equable climate to know that throughout the year the average temperature of the soil for any one month never fell below the limit marking the cessation of plant growth, and that the temperature of the lower soil layers in which root development mainly takes place was always considerably above this limit. June was the only month when the surface layers of soil approached this limit. If, however, the average monthly temperature approximates this limit, it is practically certain that the daily averages must occasionally have fallen below it.



Rutherglen Experiment Farm
Soil Temperatures
Variations from day to day during Winter Months 1913.

Fig. 4.

This is, in fact, precisely what happened, and Fig. 4 sets out in graphical form the daily mean temperatures at three depths during the three winter months. From this chart it will be seen that the perturbations of temperature are very marked at the surface, but that they are far less frequent as the depth increases. Further striking testimony of this fact may be obtained by calculating the daily variation in temperature throughout the year at each of the four depths.

Thus the average daily variation in air temperature for 1913 was 26° 8′ Fah. The daily average variation at a depth of 1 inch for the year was 15° 1′; at 6 inches, 5° 9′; at 12 inches, 2° 4′; and at 24 inches, only 1° 6′. Incidentally it may be mentioned that the tabular matter given in the table is a condensed summary of over 4,000 observations.

CAN THE FARMER CONTROL SOIL TEMPERATURE?

From the foregoing brief account it will be clear that soil temperature exercises a controlling influence on plant growth. The practical question naturally arises—Can soil temperature be controlled for the benefit of the plant? *Soil temperature is the resultant of many factors, and*, though some of these are beyond control, there are others that can to a large extent be controlled by the farmer. Thus one of the most important factors in determining soil temperature is the water content of the soil. This is apparent when one realises that the capacity of water for heat is five times as great as that of ordinary dry soil. That is to say, the quantity of heat required to warm 1 lb. of water 1° Fah. would suffice to raise the temperature of 5 lbs. of soil to the same temperature. Again, a large amount of heat is required to evaporate the excess water from a badly-drained soil, and to warm up the saturated soil that remains. Some idea of the cooling effect induced by the evaporation of soil water may be gained from considering the amount of heat necessary to evaporate a given quantity of soil water. In some experiments conducted at the Rutherglen Experiment Farm last season it was found that the soil under certain conditions lost water equivalent to one-tenth of an inch of rain per day. Now this equals approximately 10 tons of water per acre. The evaporation of 1 lb. of water at 62° Fah. requires as much heat as would raise the temperature of 1,050 lbs. of water by 1° Fah. or 1 ton of saturated soil by the same amount. If there is no external source of heat then the heat required for the evaporation of water must be extracted from the soil. The loss of one-tenth of an inch of water from the surface soil over 1 acre under these conditions would require an amount of heat *sufficient to lower the temperature of an acre-foot of saturated soil* approximately 15° Fah.

These facts serve to indicate the function of water in controlling soil temperature, and serve to throw into relief the importance of drainage and good tillage.

One powerful argument for the proper draining of many of our soils in the well-watered areas of the State is that the temperature of the soil would be greatly increased thereby, and this increase would result in greatly augmented plant growth. Again, these figures show *that tillage as well as drainage has an influence on soil temperatures*. By preventing the evaporation of soil moisture by proper cultivation the large amount of heat necessary to evaporate the water is kept within the body of the soil. From this it is evident that good tillage conserves heat in the soil in addition to conserving water.

With small dairy farms, and particularly on market gardens properties, the growing of hedges and windbreaks helps to maintain the soil temperature. The effect of such shelter is to check the evaporation of water from the soil, and to raise cotnsiderably the average soil temperature. This is an important consideration to the raisers of early vegetables.

In the irrigation districts the application of cold or warm irrigation water at different seasons of the year may considerably affect the soil temperature and profoundly influence the growth. This is particularly true at the end of autumn or in early spring. The application of cold irrigation water whilst the soil temperatures are still low may seriously retard crop growth. On the other hand, the stimulating effect of warm monsoonal rains on crops at these periods is well known.

(To be continued.)

HINTS ON PACKING AND FORWARDING FRUIT FOR EXPORT.

By J. G. Turner, Chief Horticultural Officer.

One of the most important factors in the preparation of fruit for export is that of reliable and correct packing. It is generally conceded that the man who puts up his fruit in the most up-to-date manner may always rely on good returns for his produce. Not only this, the careful attention devoted to proper packing will be found to pay best in the expedition of transit from the orchard to the ship's side. It is, to the uninitiated grower, an easy matter to unwittingly place himself in the position of having to explain faulty marking or deficient packing. The inspectors appointed under the Acts governing the fruit industry usually find that the amateur shipper makes occasional errors that require correction. This means trouble and delay to all concerned. It is therefore thought necessary to bring before those growers who may be unaware of the law on the matter the principal points to be observed in putting up their produce so as to conform with all requirements.

In advices received from the United Kingdom, Europe, South Africa, and other oversea markets, the one key-note is invariably sounded:—"Pack nothing but the choicest fruit, grade evenly, pack full cases, and pack them honestly throughout; inferior, badly-graded, diseased, and dishonestly-packed fruit we do not want at any price, as it gives us more trouble than it is worth; it injures the good reputation of other shipments, and results in loss to every one concerned." Growers cannot give too much attention to this important matter. It costs just as much to pick, pack, and export inferior fruit as it does to handle only the best. Against this labour the grower often realizes dead loss, or barely sufficient return to pay his expenses, to say nothing of the bad reputation gained—a reputation, unfortunately, shared by other growers who have taken trouble to put up only the best fruit. Fruit put up under such conditions will soon find its proper level.

Hitherto, we Australians have enjoyed a comparative monopoly of British and foreign markets. The impending entry of South America and South Africa as competitors in the world's markets is a factor to be given our serious consideration. It, then, is clearly our duty to give the strictest attention to the matter of honest packing of the best grade fruit.

VARIETIES.

When it is remembered that there are nearly 2,000 varieties of apples known to the pomologist, the selection of varieties for export would appear to be a fairly wide contract. The intending shipper, however, need not trouble over more than five or six varieties. There are three varieties mostly sent from this State, which have gained the best all-round results. These are the Jonathan, Cleopatra (formerly

New York Pippin), and Dunn's Favorite (formerly known as Munroe's Favorite). There are three other varieties which may be also recommended, judging from the results of the last ten or twelve years, viz., Rome Beauty, Esopus Spitzenberg, and London Pippin (formerly Five Crown). There are, of course, other good varieties such as Statesman (formerly Chandler), Newtown Pippin, Rhymer, Baldwin, Ben Davis, Bismarck, King of Pippins, Prince of Pippins, Scarlet Nonpariel, Cox's Orange Pippin, Stone Pippin, Adam's Pearmain, Dumelow, Winter Strawberry, Sturmer Pippin, and others.

With regard to pears, the varieties mostly sent are Vicar of Winkfield, Winter Nelis, L'Inconnue, Josephine de Malines, Broom Park, Eyewood, and Glou Morceau. Other varieties which have been sent and carried well are Beurré Clairgeau, Bon Cure, Beurré d'Anjou, Autumn Bergamot, Winter Cole, Keiffer (formerly Keiffer's Hybrid), and Magnifique. The soft varieties such as Beurré Bosc, and Williams' Bon Chrêtien have been sent under special conditions within the past two or three seasons, and have carried very well; but it is not advisable to ship these except under those special conditions, as the voyage is much too long under ordinary conditions for the successful carriage of soft varieties.

PICKING.

The exact time for picking pip fruits, such as apples and pears, can only be determined by actual experience. In a general way, it may be stated that such fruits are fit for export when the pips have changed from their original light tint to a brown colour, but this, in itself, is not always sufficient. The fruit should be well developed, but not fully ripe. Some amount of colour should be developed in red varieties of apples—such as the Jonathan, for instance. Undersized fruits should be left on the tree for home requirements, or may be left to develop for later shipments. Fruit should not be picked unless dry. Gather it in the early part of the day before it becomes warm by the heat of the sun. Avoid all bruising, as bruised fruit is useless for export. For this purpose a light-pointed ladder shaped something like an elongated letter A should be used. Do not shake or drag the fruit from the trees. Cut or break each fruit off at the spur. Handle your fruit from first to last with the greatest care. The picked fruit should be placed in a bag worn in the same manner as an apron, and should be made so that it may be opened at the bottom, thus allowing the fruit to run out into the boxes with a minimum of bruises. Bruised fruit will not carry for export.

COOLING.

Before packing, the fruit should be cooled off. It should be run into the shade of a fruit-shed or storeroom, where it will get a chance to lower its temperature. This will also assist in drying any moisture, and will toughen the skin and add to its chances of successful carriage.

GRADING.

A specially-constructed sloping table is best for the grading and packing of fruit. This slope should be sufficient to force the fruit to

travel towards the operator as he packs. Some of the biggest exporters have found that it is preferable to allow each packer to grade his fruit as he packs. Grading by machinery has been frequently tried in this State as elsewhere (United States of America and Canada), but in all instances that have come under local notice, the machines have been discarded in favour of hand-grading. The main points in grading are:—Variety, size, colour, and freedom from disease. Uniformity should be aimed at right through every case. There should be no "topping up" and no filling in the corners with small fruit. The packer himself is the only person deceived by such practices. Good, clean, medium-sized fruit is in more demand than those of larger size. Larger varieties of apples such as Rome Beauty, Esopus Spitzenberg, and Munroe's Favorite are usually put up in three sizes, viz., 3 inches, 2¾ inches, and 2½ inches. Smaller apples, such as Jonathan, usually range from 2¾ inches to 2¼ inches. Pears are usually packed in sizes of 2¾ inches and 2½ inches.

PACKING.

Wrap each fruit in tissue paper cut to cover each apple or pear thoroughly. A ream of this paper cut to 10 x 10 inches will do about twenty-two cases. Tilt one end of the case slightly up while packing. Cases should not be lined with paper as such impedes the circulation of the air in the refrigerating chamber. The ship's engineer objects to it. For padding, wood-wool or American cardboard is used. The less padding the better—from a buyer's point of view. Keep every apple, in every layer and row, uniform in size throughout the case. When the case is filled a little gentle dumping will cause the fruit to settle. A padded board placed on top of the fruit will assist the dumping. Cover the fruit with wood-wool or corrugated cardboard, and nail up with about four nails on each end of the lid.

Pears in trays must be packed sufficiently tight to preclude any possibility of their rolling about, and it must be also observed that the stalk of each pear does not injure its neighbour. Grapes are somewhat difficult to pack, as the cork-dust has to be well sifted down between the individual grapes. Experience will teach exactly how to do this. West Australian shippers have had some excellent results with the export of the grape known as Ohanez, and there seems to be no reason why Victorian growers should not be able to send, from this time onward, gradually increasing shipments of this grape which is now coming into bearing in many parts of Victoria.

CASES.

The size of cases used for the export of fruit is a matter about which there exists a good deal of misapprehension. The Federal Commerce Act does not dictate as to the size of package which should be used for fruit export. It merely specifies that the net weight or quantity of the goods shall be indicated, no matter what size the package may be.

The styles of packing may be placed under two headings—the Australian pack and the American or numerical-diagonal pack. For those

shippers who prefer the Australian method of packing and the Australian case, two sizes are in use. The sizes contain a little more than one bushel, and the cases according may be marked "one bushel," as required by the *Commerce Act.* The Victorian "dump" case measures 18 x 14 x 8$\frac{7}{8}$ (inside), and has no inside partitions. Its cubical contents are 2,236$\frac{1}{2}$ cubic inches. A case of slightly less measurement is the "Peacock" or Tasmanian "dump" case. This case measures 18 x 14$\frac{1}{4}$ x 8$\frac{2}{3}$ inches (*inside*), and has *no inside* partition. This case may also be marked "one bushel." Its cubical contents run to 2,223 cubic inches. This case is the "Australian bushel case" selected by the Fruit-growers' Australian Conference, and also by the Conference of Ministers of Agriculture. For the purpose of economizing shipping space and enabling a greater number of bushel cases to be accommodated in the ton of 40 cubic feet, the Exports Superintendent has recommended that the timber used for fruit cases be milled to gauge with $\frac{3}{4}$-in. ends and $\frac{1}{4}$-in. sides, tops and bottoms. A case so constructed, measuring inside 16$\frac{1}{2}$ inches x 14$\frac{1}{2}$ inches x 9$\frac{1}{2}$ inches would contain 2,237 cubic inches, and measure outside 18 inches x 14$\frac{3}{4}$ inches x 10 inches. Twenty-five cases of these dimensions would go to the ton, as against twenty-three, and thus a considerable saving in freight could be effected. Concerning the American case, which is so strongly recommended for use in connexion with shipments to America and Germany, this case is properly termed the "Special," or Canadian case, and measures 10 x 11 x 20 inches, equal to 2,200 cubic inches. This size is slightly less than one imperial bushel (2,218 cubic inches), but as the contents are sold by number, the bushel factor may be disregarded. For shipping purposes they should go twenty-four boxes to the ton (40 cubic feet measurement). The tops and bottoms are fastened with four cleats, each $\frac{3}{8}$ x $\frac{3}{4}$ x 11 inches. The chief advantage of packing under this system is that the buyer may tell at a glance what number of fruits he is purchasing. Another good point is that there is a large amount of "give" in each package should the cases be subjected to any jolting. The cleats provide for plenty of ventilation. It is worthy of note that fruit put up under this system at the Somerville district packing-house last season, realized at least 1s. 6d. per case more than those put up in the old Australian manner. Fruit attractively put up in these special Canadian cases, packed on the numerical-diagonal system, with printed wrappers, and each box placarded with a decorative poster illustrative of the district, brought an extra 100 per cent. profit to the sellers at Ballarat during the recent exhibition of 1913-14. The lesson of this is obvious. This system of packing has been demonstrated by the officers of this Department at the leading shows and exhibitions in the State during the past year or more, and is forging ahead slowly and surely. Further advice, pamphlets, and demonstrations of this pack may be obtained on application to the Director of the Department.

For pears, one of the most successful methods yet adopted has been that of packing the fruit in trays—one layer in each tray. Three of these trays are then cleated together to make up a single package. When packed in these trays, it is not necessary to state thereon the net weight or quantity; all that will be necessary is to give in plain figures the number of pears enclosed in each tray. The air should be allowed to circulate freely through the interstices, and thus permit the escape of

the moisture and evaporation. The use of green or improperly seasoned timber is responsible for much of the loss caused, and usually mentioned in the Covent Garden reports as "wet and wasty."

Only new cases should be used for the export of fruit from Victoria.

MARKING OF CASES.

This is a matter calling for the closest attention, as cases incorrectly marked are likely to be "held up" by the examining officer under the Commerce Act. Under the regulations of that Act, cases must be branded with the following information:—The name of the fruit contained in the case ("apples" or "pears," or such description as the contents may warrant); the quantity; the name of the grower or exporter, or his registered brand; and the word "Australia." The name of the State where grown may be given if the grower so desires. He may also add any additional information, such as the variety, or size, or grade of the fruit.

One Bushel Apples. *J. Smith,* Australia.

The whole of the brand should be marked on one end of the case, as shown above.

The port-mark or consignee's brand should be marked elsewhere on the case; but this is a matter which may be left to the grower under advice from his agent. Attention to this will materially assist the grower's interests, as it will considerably reduce the amount of handling. The shipping people have their own way of stowing and handling fruit, and to carry this out they request that the cases should be marked with the port-marks in the manner best suited to their system. Nearly every company holds a different view on this matter, but whatever is done, one thing is certain—The case should be marked at one end with all the information shown in the illustration above.

Growers may use a brand if they so desire, but it will be necessary to register the same. Application has to be made to the Controller-General of Customs for the registration of brands, and only brands which have been registered as trade marks are eligible for registration with the Customs Department. When making such application, it is advisable to quote the number of the registration, so as to facilitate checking. It is urged that different brands should be placed on fruit consigned to different ports or to or through different agents, otherwise mistakes are frequently made at the port of discharge by parcels reaching the wrong agent or consignees.

In instances where cases are packed with fruit of varying sizes in such a way as to deceive the buyer, *e.g.*, good quality on top and inferior below (and this may be done quite unintentionally), the trade description must include the word "unsorted." In the case of apples under 2¼ inches in diameter, the trade description shall include in bold and legible characters the words "under 2¼ inches," unless, of course, the trade description already includes a statement as to the size of the fruit, *e.g.*, "2 inches," or any specified size under 2¼ inches. If the goods be in an unsound, inferior, or abnormal condition, the trade description shall include in bold and legible characters the words "second grade."

It will be noted here that no provision is made to deal with colour, size, packing, &c. In Canada, such provisions are insisted upon. Grades have been fixed by legislation, and the Fruit Marks Act of that country demands that all persons who put up fruit for sale in boxes will mark the same with one of the following grades:—"Fancy, No. 1," No. 2," or "No. 3." There is no doubt in the mind of the writer that the time will come when a similar system will be adopted here, as is now the case with export butter from New Zealand, and some from Australia. In the meantime it will pay growers to co-operate in securing district packing-houses where their fruit will be properly graded and packed and forwarded under one brand for the whole district.

LOADING AT THE RAILWAY.

Until our growers, or their co-operative associations, are able to run their fruit out from their own or State-owned refrigerating chambers, or our railways provide cold storage depôts and ice cars, it is not likely that the growers will use other than the "louvre," or "U" type of truck. For cool weather, this is the best means of conveyance of fruit from the orchard to the sea-board. Fruit which has been cooled in a refrigerating chamber should not be railed in any other than an ice-car or insulated truck. This latter recommendation, of course, applies to fruit intended for shipment with fruit which has been pre-cooled. It is regrettable that the stowing of cold and warm fruit together in the holds of vessels is sometimes practised. According to the reports received from the Agent-General and from other authorities for years past, such mixed shipments do not turn out satisfactory.

Open trucks covered with tarpaulins are sometimes used for the carriage of fruit. This is the worst form of rail transit. The fruit becomes quite hot, moisture follows, and the wrappers become soaked. In wet weather the rain beats through the tarpaulin, and the floors of the trucks become covered with water. The result is that the ship's engineer refuses to take the fruit, and it is sent back for local sale.

Bad stacking in the trucks is often the cause of complaint. Cases should be so stacked that bumping of the trucks will not throw the top cases to the floor. Never stow in high stacks in the trucks without providing for possible falls. Consignments intended for different boats

should be kept apart as much as possible, and the details of each shipment *noted on the railway way-bill. In this connexion reference should* be made to the attached circular sent out by the Railway Department.

Railway Department, Melbourne, 29.1.1914.

SIR,

During the past few seasons serious complaints have been made by shipping firms and agents, &c., respecting delays in handling the export fruit traffic at Williamstown and Port Melbourne, and from inquiries made, it appears that a deal of the trouble was caused through the growers or consignors not consigning the fruit correctly at the sending station.

In many instances the following important particulars were omitted from the consignment note by the grower or consignor.

1. The name of the *consignee* to whom the fruit is despatched to at Port *Melbourne or Williamstown not shown.*

2. The name of the *steamer* by which the fruit was to be shipped at Port Melbourne or Williamstown omitted from the consignment note.

3. In showing the number of cases for export, the *description* of the fruit not correctly specified. For instance, cases containing apples having been described as pears and occasionally the particulars were shown as 25 cases of fruit instead of stating whether 25 cases of pears or apples, &c.

4. *Kind of timber cases made from*, such as hardwood or softwood not explained. The consignment note should specify the correct number of cases manufactured of *hardwood* or *softwood* timber. For instance, 20 hardwood cases of apples, 5 softwood cases of apples, 15 hardwood cases of pears.

5. *Destination* and *Port Marks* not given.

(*a*) As you are aware, the destination is the port where the fruit is *shipped to*, such as *London, Hull, Manchester, Liverpool, Bremen*, Antwerp, &c.

(*b*) Port marks or brands on the cases of fruit not specified on the consignment note.

6. *Name of Grower* omitted from the consignment note.

In connexion with this matter I am enclosing a specimen consignment note showing how fruit for export should be consigned, and I would ask that, after you have carefully perused the document, it be kept for future *guidance*.

I desire to emphasize the importance attached to the consignment note being properly filled in by you, and if the instructions are carefully carried out a deal of delay and unnecessary handling of the fruit will be saved both at the sending station and at Port Melbourne and Williamstown piers.

In the past trucks have frequently been unloaded at Williamstown and Port Melbourne in order to ascertain the port marks on the cases, sort out the ports of destination, find out whether the cases contained apples or pears, and to see if the cases were made of hardwood or softwood timber.

All this extra handling of the fruit was caused through some of the growers failing to show proper particulars on the consignment note.

The points to be remembered when filling in your consignment note are briefly as follow:—

(1) Name of consignee.
(2) Whether for Port Melbourne or Williamstown.
(3) *Name of consignor.*
(4) Number of cases of each class of fruit, and how many of the cases are made of hardwood and how many of softwood timbers.
(5) Port of destination, such as London, Liverpool, Hull, &c.
(6) Port marks or brands that are shown on the cases.
(7) Name of the steamer.
(8) Name of the grower.

P.S.—Much trouble and unnecessary delay will be avoided if growers make out a consignment note for each load, when delivered, and also if they ascertain 48 hours before date of loading whether agents have ordered trucks.

THE VICTORIAN RAILWAYS COMMISSIONERS hereby give notice that they have TWO RATES for the carriage of certain classes and descriptions of Goods—one the Commissioners' Risk Rate, when they take the ordinary liability of a carrier; the other a lower rate termed the Owners' Risk Rate, which is charged if the Consignor relieves them of all liability from loss, detention, injury, delay, or damage, except upon proof that such arose from the wilful misconduct or wilful negligence of the Commissioners. The classes and descriptions of Goods referred to are duly specified in the Goods Rates Book published by the Commissioners, but under no circumstances whatsoever will the Commissioners carry at their risk or undertake any liability in respect of the articles expressly mentioned in General Conditions No. 4 of the said Goods Rates Book as not being accepted at their risk.

Checker's Initials..........
Date Loaded..............
Loader's Initials..........

TO THE VICTORIAN RAILWAYS COMMISSIONERS. *VERNON* STATION, *23rd FEBRUARY, 1914.*

PLEASE RECEIVE AND FORWARD the undermentioned Goods to *MESSRS. JONATHAN & CO.* at *PORT MELBOURNE PIER* Railway Station, subject to the provisions of the Railways Acts and the By-laws, Regulations, and Conditions published by the Commissioners, and to the terms and conditions of the Consignment Note. So far as regards those opposite which in the column headed "AT WHOSE RISK" I have so indicated, I require the Goods to be carried at the Commissioners' Risk. As regards such of the Goods to which the two rates above referred to apply and in respect of which I have not so directed I require them to be carried at the Owners' Risk Rate, in consideration whereof I undertake to relieve the Commissioners from all liability in the case of loss, detention, injury, delay, or damage, except upon proof that such loss, detention, injury, delay, or damage arose through the wilful misconduct or wilful negligence of the Commissioners.

TRAFFIC TO OR FROM UNATTENDED STATIONS, PLATFORMS OR SIDINGS, OR STATIONS IN CHARGE OF CARETAKERS.

INWARDS TRAFFIC.—If the Goods be consigned to an unattended station, platform, or siding, it is hereby expressly agreed by the Consignor that the Commissioners' responsibility in regard to such Goods shall absolutely cease when the Goods are placed upon or left at such place, even when the Goods are carried at the Commissioners' Risk Rate.

OUTWARDS TRAFFIC.—It is hereby expressly agreed that the Commissioners will not without negligence on their part be responsible for the quantity or condition of Goods loaded at unattended stations, platforms or sidings, or at stations in charge of Caretakers.

J. LONG SIGNATURE OF CONSIGNOR OR AGENT. *VERNON*, ADDRESS OF CONSIGNOR.

Truck Number.	No. of Packages.	Description of Goods.	Marks and Nos.	Weight.				* Declared Value.			At Whose Risk.
				TONS.	CWT.	QRS.	LBS.	£	S.	D.	
	25	*Hardwood Cases Apples for LONDON*	*Z/Z*								
	16	*Softwood Cases Pears for LONDON*	*Z/Z*								
	70	*Hardwood Cases Apples for HULL*	*T. & J./H.L.*								
	75	*Hardwood Cases Apples for MANCHESTER* ..	*A.B./M.R.*								
	5	*Softwood Half-cases Plums for MANCHESTER* ..	*A.B./M.R.*								
		FOR SHIPMENT PER S.S. "TELAMON."									
		NAME OF GROWER:—J. LONG.									

Freight payable by .... Consignor.
Loaded by Commissioners.
How Weight ascertained.........................

.....................................Signature of Railway Employé receiving Goods.

* To be filled in when the increased Rate shown in Clause 2, Page 8, of the Goods Rates Book is paid

CONSIGNMENT NOTES.

With regard to the proper filling in of railway consignment notes, the Railway Department has issued a sample note.

ADVICE NOTES.

Upon despatch of fruit for export, an advice note giving full particulars are contained in the consignment note, together with number and type of truck, *e.g.* (T.449), should be immediately posted to the growers' *agent, and also a duplicate of same to the Chief Horticultural Officer,* Produce Division, Department of Agriculture, 605-7 Flinders-street, Melbourne.

SPECIAL CHEAP RATES.

Although not a matter directly connected with the export trade, it might be here mentioned that, with a view to encouraging the traffic *in small consignments of produce direct from the producer to the* consumer, the Railway Department has recently arranged for special cheap rates on goods (including fruit). These rates have been set out in a sheet recently issued, as under:—

VICTORIAN RAILWAYS.

Special Cheap Rates for Single Packages of Country Produce between any Stations open for Goods Traffic, by Mixed or Goods Trains.

Distance.	Fruit (Fresh or Dried), Vegetables, Cider, Perry, and Wine—Produce of the Commonwealth.		Honey, Butter, Eggs, Cream, Cheese, Ham, and Bacon.	
	Per Package not exceeding 30 lbs.	Per Package exceeding 30 lbs. but not exceeding 60 lbs.	Per Package not exceeding 30 lbs.	Per Package exceeding 30 lbs. but not exceeding 60 lbs.
	s. d.	s. d.	s. d.	s. d.
Up to 25 miles ..	0 4	0 6	0 4	0 6
26 ,, 50 ,, ..	0 6	0 9	0 6	0 9
51 ,, 101 ,, ..	0 6	0 9	0 8	1 0
102 ,, 150 ,, ..	0 8	1 0	0 10	1 3
151 ,, 200 ,, ..	0 8	1 0	1 0	1 6
201 ,, 250 ,, ..	0 8	1 0	1 0	1 6
251 ,, 300 ,, ..	0 10	1 3	1 3	1 9
301 ,, 400 ,, ..	1 0	1 6	1 6	2 0

Prepaid .. .. Owner's Risk.

Consignments fully addressed and consigned to the Melbourne goods sheds will be delivered at any address in the undermentioned places on prepayment of an additional charge of 4d. per package:—Albert Park, Armadale, Ascot Vale, Auburn, Balaclava, Brighton, Brunswick, Carlton, Camberwell, Caulfield, Clifton Hill, Coburg, Collingwood, Elsternwick, Essendon, Fitzroy, Footscray, Glenferrie, Hawksburn, Hawthorn, Kensington, Kew, Malvern, Melbourne, Middle Park, Moonee Ponds, Newmarket, Newport, Northcote, North Melbourne, Port Melbourne, Prahran, Richmond, South Melbourne, Sp[illegible] Williamstown, Windsor, Yarraville.

SOME MAXIMS FOR THE FRUIT-GROWER.

When packing fruit, see that the highest standard of quality is maintained throughout every season.

Remember that one inferior consignment will do more damage to a grower's reputation than a whole season's effort will efface.

Ship consignments under as few brands as possible, one preferably. (This is where the district packing-house idea comes in.)

Do not change your brands except under stress of compulsion.

Pack only the choicest fruit, grade evenly, pack full cases, pack them honestly, and put them up with an eye to advertisement.

It costs as much to pick, pack, and export inferior fruit as it does to handle only the best.

Co-operate and secure materials, labour, &c., at reduced rates, and thus save expense at this end.

Co-operate and concentrate, and thus save expense at the other end.

1st February, 1914.

PHOSPHATES IN AUSTRALIAN AGRICULTURE.

PRACTICAL experience and numerous experiments have clearly demonstrated the benefit resulting from the use of phosphates on Australian soils. Among the many advantages accruing from their use may be mentioned—

1. They supply an essential mineral plant food which is most likely to be lacking in ordinary soils. Any soil deficiency in this ingredient leads to starved crops and starved grass, and the stock grazing on phosphate starved grass cannot remain profitable to their owners.
2. The soluble phosphates have a most stimulating influence on the development of the young root system. This is apparent from the remarkable start given to young wheat chops when superphosphate is drilled in with the seed. This early start does much to secure the wheat plant against drought.
3. The feeding value of pastures manured with phosphates is greatly increased. A striking illustration of this may now be seen at the Rutherglen Experiment Station on the Top-dressing of Pasture Tests. The plot treated with 1 cwt. of superphosphate for two years is growing far more herbage of better quality than the untreated plot. In grazing, stock prefer the manured to unmanured grass land.
4. Phosphates hasten the maturity of the crop—an important factor in arid climates. They also stimulate leguminous growth and thus enable a store of nitrogenous humus to be added to the soil.

F 2

REMARKS ON RESULT OF ARTIFICIAL MANURE INSPECTION, 1913.

P. R. Scott, Chemist for Agriculture.

According to the Artificial Manure Acts, the term "manure" refers to any substance containing nitrogen, phosphoric acid, or potash, manufactured or prepared in any manner for the purpose of fertilizing the soil, or supplying nutriment to plants, but does not include farmyard or any crude offal, crude night-soil, or other unmanufactured refuse. Over the sale of all such materials the Artificial Manure Acts exercise a jurisdiction. The necessity for such a supervision is patent to all, when one considers the enormous strides that the use of artificial manures has taken within the last decade. Comparing the figures of the Government Statist in the Victorian *Year-Book*, the following increase is shown:—

Year.	Farmers Using Manures.	Acres of Crop under Cultivation.	Tons of Manure Used.
1902 ..	18,537 ..	1,099,686 .	36,630
1912 ..	29,524 ..	3,029,418 ..	94,010

These figures represent an increase in the use of artificial manures of over two and a half times the quantity used ten years ago. It has been the practice for some years now that some members of the analytical staff of the Agricultural Laboratory visit both the country and metropolitan districts to inspect and sample manure stocks at railway stations, or on the premises of agents or dealers; paying particular attention, also, to the requirements of section 7 of the principal Act, which deals with the labelling of parcels of manure exposed for sale. Great difficulty is experienced in obtaining samples at the suburban railway stations, owing to the limited time available between the transfer of the manure from the lorries to the trucks. Visits are still paid to the latter for the purpose of checking the weights, and samples are also taken when time will permit. With regard to the nett weight of the manure, complaints are sometimes heard regarding supposed cases of short weight; it is, therefore, necessary to keep control of this at the point of despatch of the manure. The inspection last year was carried out in a satisfactory manner by Mr. W. C. Robertson. He commenced early in January, and continued up to the end of July, during which time 110 samples were taken. These were afterwards analyzed, and the results published in the columns of this journal.

The samples were obtained from the following districts and towns throughout the State:—

Gippsland.—Warragul, Sale, Dandenong.
Wimmera.—Minyip, Dimboola, Horsham, Warracknabeal.
Midland.—Stawell, Ararat, Beaufort, Ballarat, Sebastopol, Warrenheip, Maryborough, Kyneton, Castlemaine.
Northern.—Mildura, St. Arnaud, Bendigo.
Goulburn Valley.—Numurkah, Nagambie, Shepparton, Echuca.
North-Eastern.—Wangaratta, Benalla.
Western.—Geelong, Drysdale, Warrnambool, Hamilton, Port Arlington.

The samples collected consisted of the following:—

41. Superphosphates.
24. Bone and Superphosphate.
17. Bone Fertilizers.
8. Special Mixed Manures.
8. Bonedusts.
5. Nitro Superphosphate.
1. Dissolved Peruvian Guano.
1. Sulphate of Ammonia.
1. Sulphate of Potash.
1. Nitrate of Soda.
1. Bonemeal.
1. Blood.
1. Animal Fertilizer.

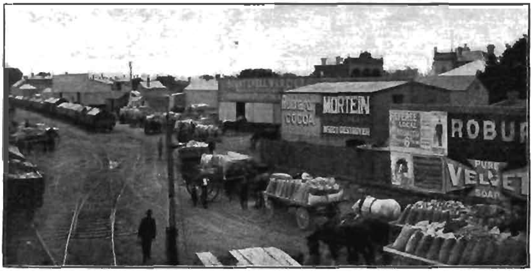


Fig. 1.—Loading Artificial Manures, Yarraville Station.

Samples were, therefore, obtained of all the more important manures on the market. From the result of the analysis, some information may be gleaned as regards their commercial value. Before discussing this, it is necessary to point out that each and every manure exposed for sale should bear a label giving full particulars as regards brand, composition, name of manufacturer, and nett weight. To meet the slight variations in the composition of the manures, which are more or less due to the process of mixing and manufacture, a schedule stating the limit of deficiency allowable has been made to protect the honest trader. The first and most important manure to be noted on the list is superphosphate. This is by far the most commonly used; it is not surprising, therefore, that the greatest number of samples collected was of superphosphate. On comparing the results of the analysis of the samples collected, 40 per cent. were under the total phosphoric acid guaranteed. As the value of this manure is due to the content of water soluble phosphoric acid, the percentage of samples under the guarantee in respect to that ingredient was 17 per cent. A striking difference was also noted in the general composition of the samples when subjected to comparison,

notably the difference between the highest and the lowest content of water soluble and total phosphoric acid—

	Highest.	Lowest.
Water soluble phosphoric acid ..	20.79 per cent. ..	16.24
Total phosphoric acid	23.87 per cent. ..	18.53

Averaging the whole 41 samples, however, it will be seen that the composition of this manure compares favorably with the quantity of each ingredient as guaranteed—

	Average Analysis of Samples Collected.	Average Analysis as Guaranteed.
Phosphoric acid, water soluble ..	17.72 per cent. ..	17.00
Phosphoric acid, citrate soluble ..	0.78 per cent. ..	1.00
Phosphoric acid, citrate insoluble ..	1.47 per cent. ..	2.00
Phosphoric acid, total	19.97 per cent. ..	20.00

The value of the average sample as obtained by means of the unit value fixed for the year shows it to be worth £4 10s. 8d., as against the price asked for the guarantee sample, £4 7s. 6d. This means a present of 3s. 2d. per ton from manufacturer to farmer.

Bone and Superphosphate.—As the name implies, this manure is made by mixing bone fertilizer and superphosphate in different proportions, the most common proportions being half bone fertilizer and half superphosphate, or one-quarter bone fertilizer and three-quarters superphosphate. Being a mixed manure, it may be reasonably expected to show more variation in composition than superphosphate. Therefore, of the samples examined, 21 per cent. were found to have less nitrogen and 29 per cent. less water soluble phosphoric acid than that guaranteed. All the samples, however, were over the guarantee, as regards their total phosphoric acid content.

The average sample, compared with the average guaranteed sample, was found to be—

	Average Analysis of Samples Collected.	Average Analysis of Guaranteed Samples.
Nitrogen	1.52 per cent. ..	1.28 per cent.
Phosphoric acid, water soluble ..	10.43 per cent. ..	9.68 per cent.
Phosphoric acid, citrate soluble ..	2.16 per cent. ..	1.21 per cent.
Phosphoric acid, citrate insoluble ..	6.37 per cent. ..	7.19 per cent.
Phosphoric acid, total	18.96 per cent. ..	18.08 per cent.

The price per ton asked for the average guaranteed sample, £5 9s. 7d.

The above figures show that the quality of the manure supplied was higher as regards its content of nitrogen and phosphoric acid, and considerably in favour of the buyer.

ESTIMATING NITROGEN.

Bonedust means a manure consisting of disintegrated bones and recent animal matter, and containing over 15 parts of phosphoric acid in each 100 parts. Any other material added to this makes it no longer a bonedust, according to the Act. Of the samples of genuine bonedust analyzed, 12.5 per cent. were found to have less nitrogen, and 37.5 per cent. were found to have less phosphoric acid than the guarantee.

Comparing the average composition with the average guarantee, the result is as follows:—

	Average Analysis of Collected Samples Bonedusts.	Average Analysis as Guaranteed.
Nitrogen	3.68 per cent.	3.45 per cent.
Phosphoric acid	20.98 per cent.	21.19 per cent.
Mechanical Condition.		
Fine bone	44.2 per cent.	48.5 per cent.
Coarse bone	55.8 per cent.	51.5 per cent.

And contrasting the value of this sample, as obtained by means of the unit value fixed for the year, the value was found to be £6 13s. 9d., as against £5 12s. 6d., price charged for average guaranteed sample per ton.

Bone fertilizer is a manure having bonedust for a basis, as it contains other material besides bones, and recently disintegrated animal

Fig. 2.—Estimating Nitrogen.

matter; it is necessary, therefore, to show on the label accompanying each parcel a correct general statement of the composition and ingredients of the elements relied upon and contained in the manure. To arrive at the true value of a bone fertilizer it has been considered advantageous to separate these manures into two grades, ordinary and low grade. The difference between these two grades may be briefly summarized. The ordinary bone fertilizer is practically a bonedust reduced in quality by the addition and admixture of some foreign material, other than one containing phosphoric acid. The low grade bone fertilizer, on the other hand, is a mixture of at least three different materials, which all supply a certain percentage of phosphoric acid, namely, superphosphate, rock phosphate, and bones and recent animal matter. Of the samples analyzed, 52.5 per cent. contained less nitrogen and 41.2 per cent. less phosphoric acid than that guaranteed.

The average composition, compared with the average guaranteed composition, was—

	Average Analysis of Collected Samples.	Average Analysis Guaranteed.
Nitrogen	3.10 per cent.	3.00 per cent.
Phosphoric acid, citrate soluble	5.25 per cent.	4.38 per cent.
Phosphoric acid, citrate insoluble	12.20 per cent.	12.40 per cent.
Phosphoric acid, total	17.45 per cent.	16.80 per cent.

The price charged for the average guaranteed sample per ton, £5 15s. 7d.

Bone fertilizer being introduced as a substitute for a bonedust, it is more than interesting to note the difference between the commercial value of these two manures when submitted to comparison—

	Average Analysis of Collected Samples of Bonedust.	Average Analysis of Collected Samples of Bone Fertilizer.
Nitrogen	3.68 *per cent.*	3.10 per cent.
Phosphoric acid, citrate soluble	——	5.25 per cent.
Phosphoric acid, citrate insoluble	——	12.20 per cent.
Phosphoric acid, total	20.98 per cent.	17.45 per cent.
At price per ton	£5 12s. 6d.	£5 15s. 7d.

From these results it is evident that not only does the bonedust contain a higher percentage of both nitrogen and phosphoric acid, but the cost of these is much lower, showing that the price of the bone fertilizer is too high when genuine average bonedusts can be bought at a cheaper rate per unit.

Special Mixed Manures.—As the name signifies, these manures are mixtures compounded to satisfy the need of the special crops named, irrespective of soil, climate, or natural condition of the soil. The practice of using these manures is one open to question; they are generally high in price, and the demand for them is limited. The average composition of the manures collected compared favorably with the average guarantee, as follows:—

	Average Analysis of Collected Samples.	Average Analysis Guaranteed.
Nitrogen	1.31 per cent.	1.32 per cent.
Phosphoric acid, water soluble	12.96 per cent.	12.19 per cent.
Phosphoric acid, citrate soluble	0.85 per cent.	0.85 per cent.
Phosphoric acid, citrate insoluble	2.27 per cent.	2.77 per cent.
Phosphoric acid, total	16.08 per cent.	15.81 per cent.
Potash	4.75 per cent.	4.39 per cent.

The price per ton of the guaranteed sample, £6 8s. 7d., when compared with the approximate cost of the plant food contained in the average sample, £5 11s. 2d., leaves a considerable margin for incidental expenses, such as mixing, &c., which items always tend to make the majority of the mixed manures of a much higher price per ton than they could be mixed by the user at his own place.

The other samples examined were all of a good quality, and being mostly single samples, no further description is necessary.

Several consignments were weighed during the year, with satisfactory results. These results speak for themselves, and are as follow:—

Average of Several Consignments.

Superphosphate, net weight found, 193½ lbs.; guaranteed, 186⅝ lbs.
Superphosphate, net weight found, 189¼ lbs.; guaranteed, 186⅝ lbs.
Superphosphate, net weight found, 189⅝ lbs.; guaranteed, 186⅝ lbs.
Bone fertilizer, net weight found, 184¾ lbs.; guaranteed, 186⅝ lbs.

Prosecutions.—It is satisfactory to note a decrease in the number of prosecutions during the year when compared with previous years. During the year 1912, 10.3 per cent. of the samples collected were found to be adulterated. During the past year 2.7 per cent. were found, on analysis, to be under the limit allowed by the Act.

Prosecutions took place at Geelong, Braybrook, St. Arnaud, and Mildura, and in each case with success. In one instance only was a penalty of £25 inflicted. The maximum penalty under the Act for a first offence is £10; for repeated offences, £50. From past experience this maximum penalty would appear to be too low. One particular factory has been fined for supplying adulterated manure in 1909, 1911-12-13. Naturally a £50 fine will not deter a manufacturer with about 1,000 tons yearly output producing a manure from £1 to £1 5s. per ton under value, as adulteration to this extent produces extra profit in addition to the ordinary profit of manufacture. Some of the smaller manufacturers are anxious to keep strides with the larger ones, and in this respect a case came under notice during the year.

One of the animal fertilizer manufacturers had some demand for a manure containing a mixture of superphosphate and animal fertilizer. However, in supplying an order for this mixture, his stock of superphosphate on hand was not sufficient to make a manure equal to his guarantee. He, unfortunately for himself, mixed what he had with the animal fertilizer, and sent out a manure with a low water soluble phosphoric acid content. Samples of this make were obtained, and, being under guarantee, this manufacturer was prosecuted.

Prosecutions under section 7 of the Act, *i.e.*, the section requiring labels to be attached to the bags containing the manure, are regarded as technical cases. This is hardly correct, as omission to register a brand practically renders information on the label invalid. Again, the chemical composition of a bonedust may be correctly stated on the label, without a guarantee as to its mechanical condition, allowing, in a case like this, a bonedust to be sold in a much coarser condition than the registered article. Cases of this evasion have come under review, and serve to show the importance of the true and correct label.

In conclusion, it is interesting to note the trend of the farmer in certain districts for certain manures. Some years ago a farmer in the Stawell district tried "Thomas' Phosphate" on certain heavy land that did not respond to "super.," a satisfactory yield was the result. Now a fair quantity of this manure is to be seen each year at the local railway station. In other districts, superphosphate is met with everywhere, especially through the Wimmera and Mallee. In the Midlands, Ballarat, Maryborough, and the Goulburn Valley, bone and superphosphate is holding its own with super., its use having increased throughout these districts during the past two years. Bonedust is in great demand in the Western Gippsland districts, and also around Ballarat.

STANDARD TEST COWS.

RETURN OF CERTIFICATED COWS FOR QUARTER ENDING 31st DECEMBER, 1913.

The herds entered since last report number five, and are as follow:—

G. D. and H. S. Wood, Gleneira-road, Caulfield (Jersey)
Miss B. L. Robinson, Burke-road, Malvern (Jersey)
Mr. C. G. Knight, Cobram (Jersey)
Mr. J. J. Tomlin, Lyndhurst (Ayrshire and Jersey)
Mr. L. C. Mackinnon, Heyington-place Toorak (Jersey)

making a total of 24 herds now undergoing the test. Since last report the regulations have been amended, requiring cows on first calf to produce 175 lbs. butter fat, on second calf 200 lbs., and third calf cows 250 lbs. butter fat, and the following cows are recorded under the higher standard required.

J. D. READ, Springhurst. (Jersey).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Princess of Springhurst	2521	8·3·13	16·3·13	273	18¼	6,228¾	6·14	382¼	250	435¾

C. GORDON LYON, Heidelberg. (Jersey).

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Silvermine III ..	715	12·1·13	12·2·13	273	19	5,554¾	4·98	276¾	250	315½
Silver Spinney ..	1388	7·2·13	14·2·13	273	6½	3,955¾	5·54	219¼	200	249¾
Hawthorn of Banyule	1064	11·3·13	18·3·13	273	10½	7,160¼	4·91	356	250	406¼

W. BRISBANE, Weerite. (Ayrshire).

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs		lbs.		lbs.
Chaffinch of Gowrie Park	2413	17·3·13	24·3·13	273	16¾	7,518½	4·75	357½	250	407½
Heather Duchess of Gowrie Park	1449	17·3·13	24·3·13	273	16¼	7,112½	4·77	339½	250	387
Lady Brassy of Gowrie Park	2424	18·3·13	25·3·13	273	7¾	5,839½	4·75	277½	250	316
Blossom of Gowrie Park	2411	19·3·13	26·3·13	273	12¼	8,693¾	4·94	429¾	250	489¾
Ida of Gowrie Park ..	2423	27·3·13	3·4·13	273	23	10,867¾	5·1	555	250	632½

W. WOODMASON, Malvern.

Completed since last report, 8. *Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Daphne of Melrose VI.	957	7·3·13	14·3·13	273	16½	5,336	6·42	342½	250	390½

* Six others have qualified for the Certificate, but have not yet been accepted in the Herd Book.

P. E. KEAM, Heidelberg. (Jersey).

Completed since last report, 4. Certificated, 1.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Dewfall	968	26·12·12	2·1·13	†270	26¾	7,647¾	4·67	357	250	407

* One other qualified, but Herd Book No. not furnished. † Sold.

CEREAL GROWING; CHANGE OF SEED.

A BELIEF commonly held among cereal growers is that change of seed is more or less necessary every two or three years. It would appear, however, that this belief is founded on opinion rather than on well-ascertained fact.

In Canada decided results have been obtained at the Ontario Agricultural College. A number of varieties of oats, barley, wheat and potatoes have been grown in the experimental grounds from 18 to 24 years without a change of seed from outside sources. In practically all cases the yields per acre in recent years have been greater than those during the earlier part of the experiment. Taking an average, it is found that the yields have increased to a marked degree. The soil on which these varieties have been grown has changed but little in fertility during the period under review.

It therefore seems possible to grow the same varieties for a considerable length of time without change of seed, providing care is taken in the selection of the seed and in the growing of the crop.

The disadvantages of change of seed are:—

1. Introduction of weed seeds.
2. The plants may not be acclimatized.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART XII.—CO-OPERATION.

(Continued from Page 123.)

By E. Meeking, Senior Fruit Inspector.

The foregoing chapters of the present articles, and also the annual reports on the oversea trade, published in this journal from 1907 to 1911, have been devoted to pointing out various disabilities under which the fruit industry, and particularly the oversea fruit export section, labours. The aim has been to show that the industry in all its branches, local distribution and sale, Inter-State and oversea export, suffers through the large percentage of waste, both of effort and material, which occurs through want of applying economic and systematic methods in the production, handling, and distribution of our fruits. It has been contended that the causes involved in the promotion and maintenance of the present unsatisfactory conditions are so varied and deep-seated, and their removal would, in consequence, cover such a wide field of operation, that the situation could only be handled with any hope of success by combinations possessing large aggregations of the necessities—capital, labour, and material. In addition, the orchardist himself requires educating into a full appreciation of the benefits he can derive from organization. The average orchardist realizes that he, somehow, is not receiving the full fruits of his industry; but he is not quite clear as to why this is so, and he is, therefore, not aware to what extent he is being denied. As a consequence, he is prone to magnify his grievances and to attribute the unsatisfactory conditions to causes other than the correct ones.

In the articles and reports mentioned, many requirements of the fruit trade have been mentioned. Even at the risk of repetition it will be advisable to recapitulate these. They are as follow:—

1. Careful harvesting and packing.
2. The speedy cold-storage of fruits at low temperatures as soon after picking as possible, and the maintenance of these low temperatures until the fruit arrives on the market.
3. A study of the physiological and chemical changes which take place in fruits in all stages of their existence, to ascertain why differences exist in the keeping qualities of individual fruits, even when subjected to similar treatment with regard to cultivation, harvesting, packing, storage, and transportation.
4. The regulation and disposal of our fruits in markets where they find a ready sale.
5. Regulating prices in local markets, and avoidance of gluts by storage of excessive fruits.
6. The pre-cooling of all fruit prior to shipment.
7. The ocean carriage of fruit at proper temperatures.
8. The installation of self-recording thermometers on fruit-carrying steamers.

9. Provision of cool-storage accommodation at London and other ports where transhipment is often required.
10. The development of new markets at home and abroad.
11. Improved methods of consigning, sale, and distribution of fruits.
12. Fixing of all charges, commission, freights, cases, packing, material, &c., on a fair and reasonable basis.
13. The organization of the trade generally on the lines which have been adopted in California and Canada.
14. Wider education on the value of fruit as an article of diet

Since the publication of the initial articles in this journal, some of the requirements mentioned have been given attention; but, with the exception of the rapid extension of the principle of the cool-storage of fruits, no serious and organized attempt has been made to deal with any of the matters mentioned. Our methods of harvesting and packing have practically undergone no change. No attempt has been made to study the causes of decay in fruits; the sale and disposal of these still remain unregulated; the pre-cooling of fruit prior to shipment has not been generally recognised as a fixed principle; fruit is often carried on ocean-going steamers at temperatures much too high; self-recording thermometers have not been installed on all such steamers; and little effort has been made towards the opening up of new markets.

Finally, a thorough re-organization of the trade on the lines which have been so successfully adopted in other countries has not been seriously attempted.

It will be seen that a wide sphere of activities is involved to bring these requirements into operation, and that individual efforts to accomplish same would be utterly futile. During the past few years, some slight reforms have certainly been effected through the various Fruit-growers' Associations, who have voiced their grievances through the Central Association; but it is obvious that, were the representatives of the fruit-growers empowered to express the wishes of a section of the community united in business, as well as in all other interests, such requests would be more likely to receive attention than under present conditions. For example, supposing the growers considered that freight charges were unreasonable, and that the question of a reduction was under consideration, and that the body to whom the representations were being made was aware that the delegates were empowered to withdraw the business of the people whom they represented unless fair treatment were accorded, it stands to reason that more consideration would be granted than would be the case if the delegates had no such power. This argument, of course, applies with equal force to all the other questions under notice, as the fruit-growing community, if speaking with one voice when pressing a claim, and acting in concert when action were necessary to conserve their interests, would wield a power and command an influence incomparably greater than any individual could hope to possess.

Co-operative effort, supplemented in certain directions by State assistance, would appear the only effectual means by which the necessary reform may be brought into being. This is also the opinion given in the report by Mr. T. R. Bavin, K.C., a Commissioner appointed last

year by the Food Commission of the New South Wales Government to inquire into food supplies and prices. Evidence was taken in various parts of the Commonwealth, and after a thorough and exhaustive inquiry lasting for many months, and from a mass of opinions collected, Mr. Bavin recommended, amongst other things, the following:—

"In my opinion, the chief possibility of improvement in the fruit industry, from the point of view of both producer and consumer, lies in the adoption of co-operation among the growers.

"In connexion with the production of fruit, it would enable the grower to obtain cheaper supplies, and more efficient labour. It would also enable more effective measures to be taken to deal with pests and diseases.

"The establishment of co-operative packing and grading sheds, cool stores, and pulping factories in the fruit districts, would make it possible to adopt vastly better methods than are adopted at present, and to avoid a large amount of waste.

"Methods of transport, by road, rail, and by sea, could also be greatly improved and cheapened, if the growers dealt with the carrying agencies in combination, instead of individually; or, if, when possible, they established carrying agencies of their own.

"Finally, co-operative distributing agencies might simplify the process of distribution, and save a considerable part of the expense now involved in sales through independent agents.

"If, however, the growers preferred to continue to sell through independent agencies, a co-operative association would be in a much better position to select thoroughly competent and trustworthy agents, and to obtain fair treatment from them than the individual grower can possibly be.

"The history of co-operation among fruit-growers in the United States shows that the benefits of this policy are no longer merely conjectural. It has brought about large economies in the purchase of supplies, and in the charges for distribution and sale; it has improved enormously the methods of packing and grading. It has sometimes doubled the net returns to the individual grower. All these benefits have been secured without increasing the burden on the consumer.

"'The reason why co-operation is not general in this State,' said one witness, 'is that the rural population fail to realize, and have never had the opportunity to prove, that it places skilled advice and skilled service at their disposal at exceedingly moderate cost, thus raising them to a level with their more fortunate neighbours.'

"Unfortunately, co-operation has never been successfully tried in this State, and the failure of the efforts that have been made, has created a prejudice against it.

"I do not think that this prejudice is likely to be removed, or that co-operative activity among fruit-growers is likely to be established, until the Department of Agriculture takes some more active and energetic steps to impress upon growers the benefits of co-operative efforts, and to assist in organizing them into co-operative associations."

The same essentials which exist in America and elsewhere where the co-operative principle has been successfully applied, exist also in Victoria, and it is considered that similar results could be attained here. The following chapters will be devoted to an outline as to the methods by which this could be brought about. Before doing so, however, a short explanation as to the meaning of the co-operative principle, and a brief summary of the results attained by its application in other countries will be given.

(To be continued.)

BEE-KEEPING IN VICTORIA.

(Continued from page 3.)

By F. R. Beuhne, Bee Expert.

XXI.—ENEMIES OF THE BEE.

The worst enemies to bee-keeping are the three brood diseases of bees comprised under the general term of Foul-brood, and a disease of adult bees called Bee Paralysis. These diseases and their treatment were described in detail in chapter XV. Other enemies of bees are insects and birds of several species.

INSECT ENEMIES.

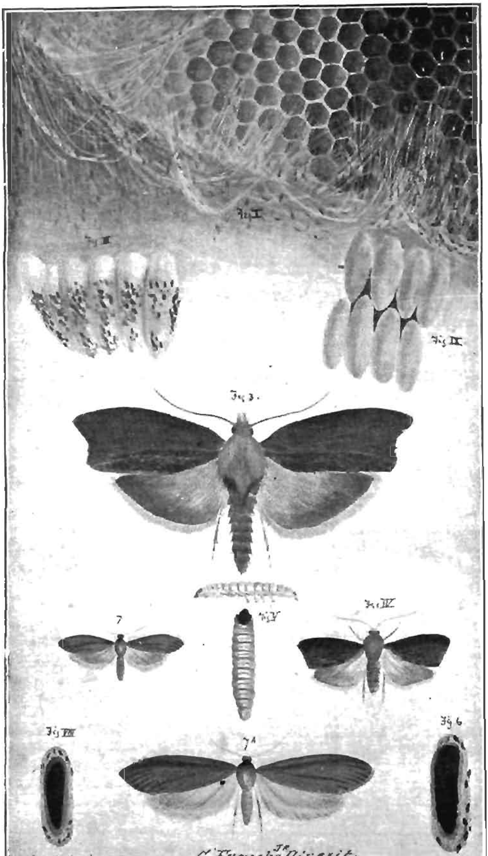
Bee Moths.

Bee or Wax Moths are great pests where common or black bees are kept in a careless manner. As a rule, black bees and neglect are found together. There is but little, if any, trouble from Bee Moths in a well kept apiary of Italian bees.

There are two species, the "Larger Bee Moth" (*Galleria mellonella*) and the "Lesser Bee Moth" (*Achroia grisella*); both species are frequently found in the same apiary; and these pests are present in most parts of the world where bee-keeping is carried on. The larvæ of both moths are great enemies to bees, and may become very destructive. They perforate the comb with burrows, thereby destroying the cells, and often cover it with a network of silken threads. The destruction of the cells and the impediments caused by the silken network partly smother the larvæ, and, as the adult bees are greatly hampered by the threads in feeding them, the larvæ are liable to be starved.

The "Larger Bee Moth," which measures about 1 inch in length, is of a dark brown colour, and the under wings are a light grey on the margin, with a lighter colour towards the centre. When young, the caterpillars are yellowish in colour, and when fully grown are a dull greyish colour.

The "Lesser Bee Moth" is a uniform coloured drab-grey moth, with a yellow head. The larvæ are whitish, with brown heads. They are usually found in Spring, on the floor of hives, amongst the waste wax, which consists chiefly of the caps of the honey cells, emptied by the bees during the Winter. The floor of the hive should, therefore, be



BEE MOTHS.

scraped clean at the first examination of hives in Spring, and the *débris* removed and burnt. When quilts or mats are used over the frames the larvæ and cocoons of the lesser wax moths are often found between the top bars and the quilt.

In Victoria there are at least four broods in a season; the first, appearing in early Spring from caterpillars that have passed the Winter in a semi-dormant condition, is not so destructive as the others appearing later, because the larvæ, being smaller, eat less than those of the larger sort, and also because they do not spin quite so profusely. Italian or Ligurian bees are not attacked to any extent.

Prevention and Remedies.

A good hive, filled with a strong colony of Italian bees, is the best preventive against these pests. Cleanliness is of the greatest importance, and to obtain this use frame hives. All moths, cocoons, and larvæ should be destroyed when found. All hives should be made of timber sufficiently thick to prevent splitting or warping, and the boxes should fit closely to the bottom board. If the timber is cracked it will enable the moths to enter, and deposit their eggs near the honeycomb.

Empty, or partly filled, combs, removed from the hives at the end of the season, should be at once put beyond the reach of the wax moth. If left standing about, even for a few hours, the odour of the combs attracts the female moths, who deposit their eggs on the combs. The eggs hatch in the following Spring to the surprise of the beekeeper, who carefully secured his combs against moths, and probably only left them about for a little time. The cocoons are attacked by a small species of parasitic wasp which helps to keep them in check.

It is assumed by many beekeepers that wax moths do some good by destroying the combs of bees in trees or neglected hives which had succumbed to foul-brood. Experiments made by Dr. E. F. Phillips, of the United States of America Department of Agriculture, have proved, however, that the spores of foul-brood still remain capable of producing disease after the combs have been totally destroyed by wax moths, and the only point in favour of these moths from the beekeeper's point of view is therefore disproved.

EXPLANATION OF PLATE.

Bee Moths.

"The Larger Bee Moth." (*Galleria mellonella*, Linn.)
"The Lesser Bee Moth." (*Achræca grisella*, Fab.)

Fig. I. Honeycomb showing appearance when attacked. Natural size. From Nature.
Fig. II. Cocoons of *Galleria mellonella*. Natural size. From Nature.
Fig. III. Perfect Insect. Male. Magnified. From Nature.
Fig. IV. Perfect Insect. Female. Natural size. From Nature.
Fig. V. Larvæ of *Galleria mellonella*. Natural size. From Nature.
Fig. VI. Pupa of *Galleria mellonella*. Enlarged. From Nature.
Fig. VII. Perfect Insect of *Achræca grisella*. Natural size. From Nature.
Fig. VII.A. Perfect Insect of *Achræca grisella*. Magnified. From Nature.
Fig. VIII. Pupa of *Galleria mellonella*. Natural size. From Nature.
Fig. IX. Cocoons of *Galleria mellonella*. Natural size. From nature.

Dragon Flies.

Of other insects which prey upon bees the most formidable is the Dragon Fly. This insect, generally called horse-stinger, is very numerous in some districts. It cruises about over the hives and pounces upon bee after bee, and as it merely draws the juice from the body of the bee and then drops it, a single dragon fly destroys a good many bees during a day. As this insect is very swift and alert, it is difficult to combat. Something like a tennis racket, but covered with a closer mesh, is the most effective weapon to strike them down, and while it would not be profitable for an adult to engage in the destruction of dragon flies in this manner, boys will readily take to it as a pastime.

Ants.

Ants are often troublesome in an apiary, and while the number of bees actually destroyed by certain species is not very large, they keep the bees in a state of irritation and excitement, resulting in the stinging of persons and animals coming near the hives. There are four out of the many species of ants which annoy bees and their owner more than the rest. These are (1) the Red Ant (Meat Ant), (2) the Sugar Ant, (3) the Black Wood Ant, and (4) the small Black Ant.

Amongst amateur beekeepers and the public generally an idea prevails that to protect bees against ants the hive must be raised on a stand, the legs of which stand in water, or that the hive must by some other means be made inaccessible to ants. When beekeeping is carried on commercially such devices are almost impossible and ineffective. The amount of material and labour required to put even a moderate-sized apiary on ant-proof stands, and the time necessary to keep the devices in working order, would be an altogether too heavy item of expenditure. While this way of protecting hives against ants is, perhaps, the best for one or two hives of bees, it is not only too laborious, but also ineffective in an apiary, for while with constant attention it is possible to keep the ants away from the hive itself, many of the bees returning home heavily laden during a honey-flow alight on the ground near the hive, and there fall victims to ants before they have rested sufficiently to again take wing to reach their home. Where hives are standing directly on the ground, bees alighting on it walk home, which they are quite able to do, although too exhausted to fly. A colony of bees in normal condition, and located in a properly-constructed hive, is quite able to take care of its home, provided any ants' nests in the immediate neighbourhood of the apiary are destroyed.

The Red Ant, which is the most troublesome, is easily traced to its hill, and can quickly be destroyed by means of carbon bisulphide, such as is used for the destruction of rabbits in their burrows. On a cold day, or towards evening, put a tablespoonful of the liquid into each hole and immediately close it up with wet clay. The gas into which the liquid evaporates is heavier than air, and penetrates to the lowest depth of the ants' nest, destroying ants, larvæ, and eggs. Carbon bisulphide is highly inflammable and explosive; great care should, therefore, be exercised in handling it, and no light allowed within a considerable distance of it. Further, to be effective it should not be exploded after it is applied to the ant-hill, as some suppose.

When carbon bisulphide is not available, a temporary expedient may be employed by repeatedly putting ashes on the ant-hill, or covering it up with green bushes; in either case the ants will shift camp, but not infrequently move to a spot nearer to the bees, and destruction is, therefore, the only effective remedy.

Sugar Ants are nocturnal in their habits, and, therefore, often remain unnoticed; they will often establish themselves under hive-stands, and although I have never known them to kill bees, as the Meat or Red Ants do, yet they annoy bees much after sunset in attempts to enter the hive. Sugar ants may be destroyed with carbon bisulphide as advised above, but if located under a hive the latter should be closed and temporarily removed, but returned to the spot before morning and the bees liberated.

Wood Ants are shiny black ants about ½ inch in length. They live in holes carried down to a depth of 2 feet occasionally. There is a number of such burrows some distance apart, and sometimes connected with surface tunnels. There are also summer nests made of fibre and pieces of fine grass, and built against the stems of young trees or in stumps and behind the bark of dead trees. This ant is, fortunately, not found in many districts; it is very difficult to deal with, as there are so many small nests not easily found. The distinguishing characteristic of this species is its indifference to cold. It will be found quite active at times when bees are in a semi-dormant state. It is never seen out in sunlight, but keeps in the shade, and does its marauding work mostly at night. Carbon bisulphide applied to the nests whenever found is the only remedy. The small black ant, which sometimes becomes very numerous in apiaries, is distinguished from the former by its more slender build, quicker movements, and much larger colonies. Its objective is honey, as distinguished from the Wood Ant, which preys upon bees.

Of the many ant remedies advertised, some are useless, while others cannot be applied in an apiary, as they would be destructive of bee life.

Spiders.

There are several species of spiders which prey on bees. The black spider with a red mark will increase rapidly in an apiary if left undisturbed, and will exact a heavy toll in bees. The lurking places under covers and other shelter spots about hives should be periodically examined, the spiders killed, and the balloon-like cocoons containing their eggs burned.

(To be continued.)

JUNIOR MIGRATION TO VICTORIA.

By Thos. E. Sedgwick.

The rapid increase of the movement for the migration of lads from Home to farms in Victoria and other parts of the Empire has been as rapid during the last few years as the growth of immigration to Australia generally.

Although this may at first sight appear surprising, it appears on examination to be only natural, as junior migration within the Empire has the following advantages over adult migration:—

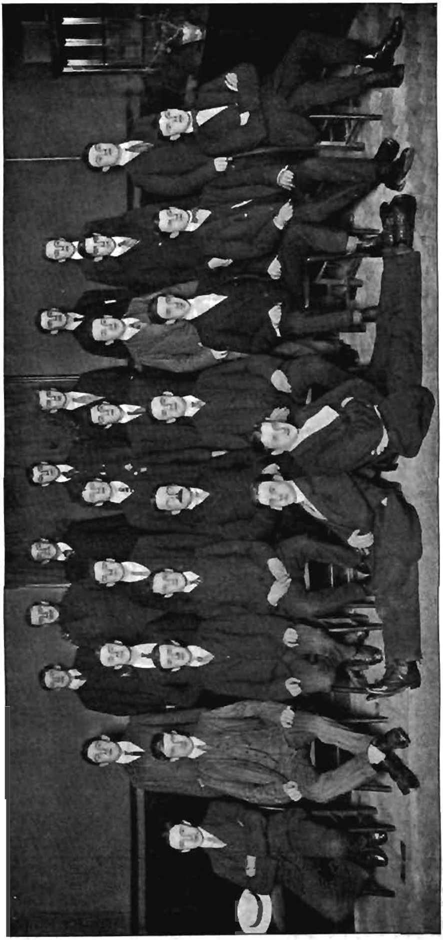
(1) It gives a longer life for the same fare.
(2) Lads are more adaptable, learn more quickly, and are more useful, both in the house and on the farm, than men are.
(3) Having no family dependent on them, the lads can afford to attract their relations out to them at nominated rates of passage.
(4) They can learn and save money at the same time, and thus in a few years' time take up land themselves.
(5) Being single, they can go up into the backblocks as pioneers, instead of requiring to have farms ready made before their arrival.
(6) They can then marry, and their children will be far healthier than if they had been born under the overcrowded, and consequently underpaid, conditions of employment at Home.
(7) Their experience being acquired locally, they will be certain of success, whereas men from the Old Country sometimes find they lose their capital in acquiring knowledge of local conditions.

A Committee of Managers of lads' clubs, brigades, and other social organizations at Home was formed over four years ago to advance the migration of town lads to farms in the Dominions. In June, 1909, application was made to the Agent-General for Victoria for his Government to try town lads on farms, to which he replied:—

> "I desire to say that until my Government is prepared to receive a number of boys and to farm them out amongst the farmers, I would not be able to give you a definite reply. . . . . . I might say that two years ago I endeavoured to secure co-operation with some of our well-to-do farmers, with a view to taking a number of boys, but nothing came of it."

Subsequently, small monthly parties of unemployed boys from West Ham were sent out, as an experiment, to this State, the fares being advanced by the local Distress Committee. Now as many as 3,000 British lads would be gladly accepted during the current year, provided they were between the ages of sixteen and twenty years of age, of good character, intelligent, healthy and well developed, and willing to take up farm work in Victoria.

The Governments of New South Wales, Queensland, and Western Australia have also taken smaller parties of town lads with gratifying results. The South Australian Government decided to try a party of



Typical party of Lads by s.s. "Port Lincoln" and "Geelong." Mr. Sedgwick the originator of the idea in the centre.

81 such lads, who arrived in June, 1913, and the Secretary of the Crown Lands and Immigration Department reports:—

These boys were from Croydon and Streatham, near London, Tunbridge Wells, and other places in Kent, and some contingents of boy scouts. Their average age was eighteen years.

The work they have been put to includes milking, stone picking, ploughing, carting water, clearing and burning scrub, fencing, chaff-cutting, attending to stock and poultry, trapping rabbits, chopping wood, odd jobs, and general farm work. The fares were advanced by the Government, and the boys signed a procuration order on the employer in the following terms:—

To Mr. . . . .

. . . .

I hereby authorize you to deduct from wages to become due by you to me from time to time, and pay to the Immigration Officer, Crown Lands Office, Adelaide, in six monthly instalments of pounds shillings pence each, commencing on 14th November, 1913, the sum of pounds shillings and pence, being the balance due by me to the South Australian Government for passage provided for me as an assisted immigrant to South Australia.

I may say that already £100 12s. of the amount of £213 7s. 6d., which has fallen due, has been received back during the past four months (*i.e.*, since the arrival of the boys), and I do not anticipate that much, if any, of the balance will be lost. Considering the fact that the boys were somewhat hurriedly collected, this result cannot be regarded as other than highly satisfactory.

The Government of South Australia have now passed an Act for the apprenticeship of such lads to farms, and, if necessary, other employment, on the same lines as those adopted by the Government of New Zealand, who received the first trial party of town lads for farms three years ago, which proved what ideal farm workers were the lads, who, by the accident of birth, were in so-called "blind-alley" occupations at Home, and whose continuance there constituted a direct menace to the local labour conditions, since boys were taken on to do men's work at low wages, and were discharged on reaching manhood themselves.

In the interests of the lads themselves, of labour generally, and the future prosperity of the State, it is essential that all migration, especially that of a junior order, should be carried out under official supervision. The Government alone are independent and impartial, and no one else has the necessary machinery for selecting situations, supervision, and the collecting back of the amounts of the fares advanced.

Few, if any, cases of failure have been reported of a lad under eighteen who has migrated to farm work overseas, but many persons of mature age come out at their own charges to find that there is no work available for them at their own trade, and that they are too old to learn farm work. These either go Home again, or their continuance here is a distinct menace to the local labour conditions. Those who remain on the land are, however, a distinct advantage to labour in the towns, as they are each individually responsible for the consumption of food and clothing to a considerable amount each year, and collectively they facilitate the development of railways and the opening up of new country. When experienced, their labour applied to the land increases the natural production by, at least, £100 a year each, and thus augments the wealth of the State, the very existence of which is due to immigrants.

The conditions of employment and the wages payable at Home do not permit of lads saving sufficient money to pay even the reduced fares

formerly offered by the Government of Victoria, but the wages paid on farms make it quite easy for them to repay any amounts so advanced within six months of their arrival. The harder a lad is worked at Home, and consequently the better he is suited for farm work, the lower are his wages. It is thus evident that the most likely types of lads are those who have the least means of paying their fares in advance, and those who may be able to find a few pounds at Home are by no means the most successful workers on the land here. Moreover, the younger the boys are, the better they will settle, but the less ability they have to find any fares for themselves. Many, indeed, cannot provide an outfit.

Suitability for the work should undoubtedly be the criterion for selection in future, and not any financial qualification. When the latter is removed, most of the boys of the Old Country will be found anxious to come.

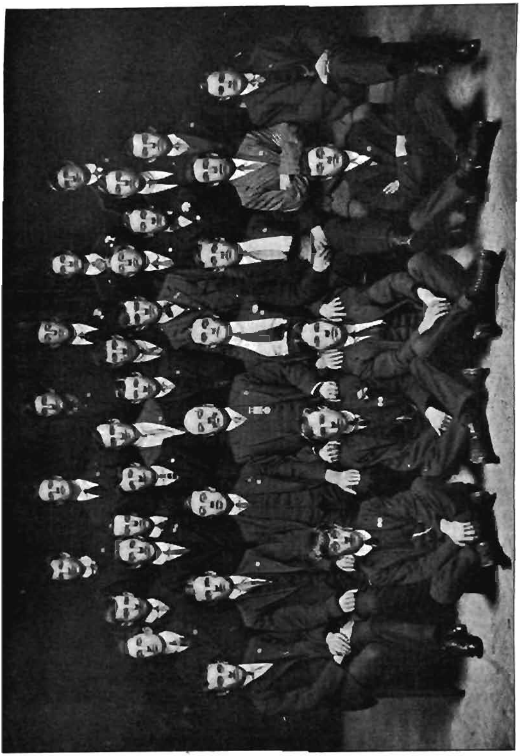
Both New Zealand and South Australia, having thus adopted the principle of apprenticeship, with the contingent banking of wages under Government auspices, are circularizing their farmers to ascertain the number of lads required.

As there are comparatively few country lads at Home available for migration, and they have much to unlearn, and can never become so quick, active, and receptive as town boys are, it is to the overcrowded centres of population that we shall have to look for future increases in our immigration work. When these in time become landowners themselves, the demand will proportionately increase, as they will also require labour, as well as their former employer, for which the natural increase of population will not suffice, as it has to be born at least fourteen years ahead of the need occurring. Farmers in Victoria, as elsewhere, are, however, shy of teaching lads who may leave at short notice after being instructed in milking, riding, team work, and other rural duties, but all those who have been consulted are unanimously in favour of some minimum period of employment in the same situation with or without apprenticeship.

The following have been found to be the best lines for placing out lads, the farmers to undertake to maintain the lads for a definite period, with the proviso that either party shall be at liberty to terminate the agreement at the expiry of one month should they find they are not suited to each other. The agreement to be for at least one year. Both the situations and the lads to be selected by the Government. The wages to be, at least, 10s. a week for the first six months, unless the employer finds that the lad is worth more. All wages, except pocket money, to be paid on the lad's account to the Department of Immigration, who, after refunding the amounts expended on their migration, will bank the money for the lads.

It may be contended that this is a counsel of perfection, but the more trouble that is taken at the outset, the better will the lads settle in after life. It keeps them on the land during the crucial period whilst they are becoming accustomed to rural conditions, and so prevents them rushing up to towns, to the detriment of local labour conditions.

The two photographs here reproduced show the type of lads who are anxious to come to Victoria, and whose wages at Home do not generally exceed 12s. a week.



Party of Lads by s.s. "Hawkes Bay." Voyage, June to August, 1913.

The following extracts from employers' opinions of the lads, and the opinions of the latter with regard to their treatment and prospects, speak for themselves. They have been supplied by the Department of Immigration:—

OPINIONS RECEIVED FROM EMPLOYERS OF LADS ON FARMS IN VICTORIA.

"The lad is still in my employ, and is willing and suitable for the work."

"I am pleased to say that the lad is very satisfactory."

"The boy is very willing and anxious to learn, and is saving up to get his mother and sister out."

"They are both well behaved, good-mannered, and respectable young men, and I trust to make them good, honest working young fellows."

"I am pleased with the lad."

"He is a good, honest lad, civil and industrious, and learning to do his different kinds of work well."

"We could do with more of their sort."

"I find him a willing and earnest worker."

"I would be sorry if the lad were to leave, for he is a really good lad, very trustworthy and willing."

"The importation of such lads must surely be beneficial to such a sparsely populated country."

"He is a steady, sober, and honest young lad, and is giving every satisfaction."

"The lad is getting on splendidly. He is a fine worker, and a most respectable young fellow."

OPINIONS OF IMMIGRANT LADS ON VICTORIAN FARMS.

"I am pleased to say I am settling down in my new surroundings, also that I please my mistress with my work."

"I am getting on all right in my situation, and I feel sure that I give satisfaction, and I feel quite settled down."

"I am getting on excellent, and have some grand surroundings. My employer is a very nice gentleman, and is giving me a very grand chance to get on, which I shall try my very best to do, and be very thankful to him for what I learn."

"My employer is quite satisfied with me, and I am quite satisfied myself."

"I have settled down to my work ambitiously, and I think to the entire satisfaction of my employer. The surroundings are well suited to me."

"I like the country very much, and also the working conditions, and I am quite satisfied with Australia."

"I am glad to say that I am going on all right, and I am quite happy in my new surroundings."

The Immigration Department is continuing to bring out more lads each month, and to place them with approved farmers, so that should any agriculturists in the State be desirous of obtaining this high type of labour, and of benefiting the lads from the Old Country, he can apply to the Officer in Charge of the Department at 555 Flinders-street, Melbourne.

Mr. Sedgwick represents British societies interested in junior migration, and has been acting in co-operation with the Immigration authorities of New South Wales, Victoria, South Australia, and New Zealand.—EDITOR.

American Peat Production—

The production of peat for fertilizer in 1912, so far as reported, was 41,080 short tons, of which about 8,000 tons was sold as air-dried. The value of this material, at the selling prices reported, was 186,522 dollars, approximately £33,300, at 16s. per ton.

It is also sold for and used in mixing stock feeds, and also as a stable litter. Its absorbent and deodorizing power makes it eminently suitable for the latter purpose.—*Fertilizers*, September, 1913.

Victorian peat deposits analyze about 2 per cent. nitrogen on the air-dry sample, the lowest unit value for which is 13s., the commercial value, therefore, would be about 26s. per ton, this not taking into account its value from the stand-point of humus.

Sulphur and Lime for Disease—

The effect of sulphur and lime upon diseases of cereals and roots was referred to in a paper by Walter E. Collinge before the British Association for the Advancement of Science.

In Warwickshire, in 1906, he said his attention was directed to some 40 or 50 acres of wheat attacked by a disease locally known as "may-sick."

In various parts of the field, either in large circular patches or in straggling lines, the wheat plants were turning yellow in the leaf, and had attained a height only about half of that of the non-diseased plants.

Later in the season the plants had a scorched appearance, very little growth took place, they never developed ears, and were of little use as straw.

Other crops, including potatoes and mangolds, were attacked in a similar manner.

Experiments with varying quantities of sulphur, and lime and sulphur showed that sulphur sown in the autumn for spring sowings, or in the spring for autumn sowings, at the rate of about 6 cwt. per acre, afforded a complete cure. In other cases, ground unslaked lime applied before the sulphur gave even better results.

As to the cause of the disease, the view formed was that it was due to bacteria interfering with the nutrition of the plant.—*Fertilizers*, September, 1913.

Patches of this description are met with in Victoria, and either a dressing of lime or soda nitrate have proved beneficial.

New Use for Artificial Fertilizers—

Experiments by M. Kuhvert demonstrate the usefulness of artificial manures in pisciculture, according to *La Tribune Horticole*.

The addition of Thomas' phosphate and kainit led to an increase in weight of the fish from 420 to 640 lbs., whilst by the addition of sodium nitrate also the weight rose to 800 lbs.

An increase in the aquatic flora leads to an increase in the minute fauna, and this, in turn, results in an increase in the fish.—*Fertilizers*, September, 1913.

STATISTICS.

Rainfall in Victoria.—Last Quarter, 1913.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	October.		November.		December.		Last Quarter.	
	Total.	Average.	Total.	Average.	Total.	Average.	Total.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	165	274	226	181	158	158	549	613
Fitzroy, Eumerella, and Merri Rivers	156	283	283	187	166	168	605	638
Hopkins River and Mount Emu Creek	115	240	250	187	136	173	501	600
Mount Elephant and Lake Corangamite	131	235	252	187	123	172	506	594
Cape Otway Forest ...	212	335	428	234	148	236	788	805
Moorabool and Barwon Rivers	152	236	236	192	119	199	507	627
Werribee and Saltwater Rivers	139	229	124	190	99	225	362	644
Yarra River and Dandenong Creek	269	327	477	268	149	333	895	928
Koo-wee-rup Swamp ...	245	331	488	250	170	288	903	869
South Gippsland	296	368	445	256	122	327	863	951
Latrobe and Thomson Rivers	395	354	685	262	119	321	1,199	937
Macallister and Avon Rivers	324	222	271	191	34	264	629	677
Mitchell River	292	268	186	204	31	249	509	721
Tambo and Nicholson Rivers	277	284	186	183	49	282	512	749
Snowy River	359	336	262	211	53	279	674	826
Murray River	231	171	58	149	77	150	366	470
Mitta Mitta and Kiewa Rivers	382	315	166	266	118	256	666	837
Ovens River	334	316	195	246	106	244	635	806
Goulburn River	205	226	173	187	110	187	488	600
Campaspe River	178	192	118	165	119	182	415	539
Loddon River	175	157	83	138	93	132	351	427
Avon and Richardson Rivers	191	135	47	118	90	100	328	353
Avoca River	193	140	58	125	78	119	329	384
Eastern Wimmera	199	183	70	155	70	134	339	472
Western Wimmera	213	182	109	135	76	100	398	417
Mallee District	241	112	30	95	84	87	355	294
The whole State ...	312	221	178	171	100	179	590	571

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

PLANTING.

Where new areas are being prepared in anticipation of planting out in the autumn and winter, the autumn rains will be of immense benefit. Ploughing will be greatly accelerated; and if the land has been already ploughed, the subsoil will receive an excellent soaking.

In preparing land for planting out—and this should be commenced right away, so as to allow the soil to sweeten—it should be subsoiled, so as to produce good results in after years. Subsoiling will add to the age and vigour of the trees, it will materially increase the crop, and it will considerably lessen the expense of fertilizers. Reference has previously been made in these notes to the success attained from growing fruit trees in subsoiled land; but the fact may be again pointed out that many growers in Victoria are to-day reaping the benefit of increased crops without artificial feeding, where the soil was subsoiled before planting. Draining is another most important factor in successful fruit culture; but while, perhaps, drainage may be delayed for a few years, if the other initial expenses are extensive, it must again be emphasized that proper subsoiling cannot be carried out after the trees are planted.

GREEN MANURES.

If a cover crop of leguminous plants is required for green manuring, a start at planting may now be made. This can only be done when all of the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will well cover the surface before winter.

CULTIVATION.

Should the weather become hot and dry, it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered, a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

PESTS.

No codlin moth affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

Rust-affected plum and peach leaves, as well as all foliage of stone fruits that have been attacked by this and other fungus diseases, such as shothole, &c., should be burned if possible. This will minimize the possibility of future attacks. The same treatment should be given to foliage where either red spider or Bryobia mite have been in evidence.

Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through till the spring time. *It is doubtful whether any chemical means should be taken to keep the* weeds in check in this section. Both red oil emulsion and lime sulphur wash have been used for this purpose; but the work is merely in an experimental stage, and this treatment cannot be generally recommended. It will be best for the present to resort to hoeing and hand-weeding.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bone dust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus to the soil. Large plots should be avoided in winter; where such occur, a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrot, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned out and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

Flower Garden.

Good autumn cultivation, mulching, and watering, if the rain does not come in sufficient quantity, are among the principal work this month. The stable manure mulch should not be stinted at this season of the year, and garden plants should be given every encouragement. This especially applies to such plants and shrubs that will be blooming in autumn and winter. If these are strengthened by food and water supplies, good growths will result, which means a copious supply of bloom.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure—the latter is preferable. In case the feeding should not be too strong nor too frequent, it should always be withheld before the flowers come. If the manure is supplied in the form of mulching, it will be well to occasionally fork over the ground, so that the soil does not become sour. The same instructions may be taken for the autumn growing of roses.

All classes of spring flowering bulbs may now be planted. In bulb planting, the bulb should not come in contact with any manure. The manure should have been some time previously dug well in, and mixed with the soil, and all heat should have disappeared. If such manure is required, it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy, a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the

size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

All hardy annual, biennial, and perennial seeds may now be planted, Among these are dianthus, candytuft, sweet peas, Iceland poppies, *anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox,* penstemon, pansy, gallardia, &c.

Wherever aphis and red spider occur, the plants should be sprayed with *benzole emulsion, nicotine, pestend, or soaperine,* or some other preventive, in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

THIRD VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1913-14.

Monthly Report Ending 14th February, 1914.

The tenth monthly report of the above competition is as follows:—

The weather conditions during the past month have been very trying to the birds, owing to the constant heat.

Special attention was given to watering the dust bath, and also under the trees for shelter, and the hose has had to be used on the roofs of the houses.

The leaders, Pen 23 (J. H. Gill), are looking well, and maintaining their lead, while Pen 11 (C. J. Beatty) has returned to second place. More birds are going through the moult.

The general health of the birds on the whole is good, all being bright-looking, and still maintaining their appetites.

The food is exactly the same as that mentioned in last month's report.

There has been one death and one replacement through blindness Pen 53 (Greenhaigh), Black Orpington; one replacement through ovary trouble, Pen 28 (Waldon); one through an internal growth had to be destroyed, Pen 22 (Mitchell).

The rainfall during the month was 114 points, spread over three days, there being one heavy shower.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No of Pen.	Breed.	Name of Owner.	Eggs laid during Competition.			Position in Competition.
			April 15 *to* Jan. 14.	Jan. 15 *to* Feb. 14.	Total to *date—10* months.	
23	White Leghorns	J. H. Gill	1,283	139	1,422	1
11	..	C. J. Beatty	1,180	141	1,321	2
35	..	Moritz Bros.	1,167	149	1,316	3
8	..	E. H. Bridge	1,172	138	1,310	4
6	..	J. S. Spotswood	1,193	110	1,303	5
48	..	Thirkell and Smith	1,167	133	1,300	6
31	..	W. G. Swift	1,145	142	1,287	7
7	..	H. McKenzie	1,137	142	1,279	8
10	..	T. A. Pettigrove	1,138	126	1,264	9
20	..	C. B. Bertlesmeier	1,112	143	1,255	10
5	..	G. W. Robbins	1,102	150	1,252	11
50	..	A. H. Mould	1,108	129	1,237	12
40	..	George Edwards	1,091	141	1,232	13
65	..	E. A. Lawson	1,121	108	1,229	14
34	..	J. E. Bradley	1,100	128	1,228	15
21	..	A. Ross	1,103	114	1,217	16
66	..	W. Featherstone	1,083	128	1,211	17
2	..	R. W. Pope	1,081	129	1,210	18
49	..	M. H. Noye	1,070	128	1,198	19
24	..	Redfern Poultry Farm	1,055	138	1,193	20
67	..	C. Hepburn	1,055	138	1,193	
61	..	Jno. Campbell	1,073	107	1,180	22
32	..	H. Hanbury	1,061	116	1,177	23
26	..	B. Rolls	1,045	128	1,173	24
41	..	Percy Walker	1,043	114	1,157	25
33	..	South Yan Yean Poultry Farm	1,017	139	1,156	26
58	..	Stranks Bros	1,035	107	1,142	27
14	..	F. Hannaford	1,003	133	1,136	28
37	..	C. H. Busst	1,019	103	1,122	29
12	..	A. H. Padman	977	138	1,115	30
63	..	A. Sellers	1,008	105	1,113	31
52	..	W. G. Osborne	984	129	1,113	
47	..	W. McLister	993	116	1,109	33
45	..	D. Goudie	973	124	1,097	34
57	..	Gleadell Bros.	949	140	1,089	35
62	..	G. A. Gent	969	109	1,078	36
43	..	Morgan and Watson	976	101	1,077	37
56	..	Schaefer Bros.	951	121	1,072	38
13	Black Orpingtons	T. S. Dallimore	958	111	1,069	39
44	White Leghorns	W. A. Rennie	931	134	1,065	40
3	..	S. Buscumb	943	119	1,062	41
18	..	B. Rowlinson	953	102	1,055	42
27	..	J. Sinclair	937	114	1,051	43
22	..	B. Mitchell	920	131	1,051	
42	..	A. Stringer	958	90	1,048	45
38	..	M. A. Monk	955	92	1,047	46
29	..	S. Brundrett	901	137	1,038	47
59	..	Cowan Bros.	945	92	1,037	48
30	Black Orpingtons	Jas. Ogden	899	104	1,003	49
46	..	T. W. Coto	935	65	1,000	50
36	White Leghorns	A. J. Jones	884	112	996	51
54	..	Jas. McAllan	897	97	994	52
51	Black Spanish	W. H. Steer	870	118	988	53
53	Black Orpingtons	A. Greenhalgh	882	93	975	54
55	White Leghorns	P. H. Killeen	877	94	971	55
25	Black Orpingtons	King and Watson	871	79	950	56
60	Black Spanish	Watson and Rushworth	836	104	940	57
28	White Leghorns	E. Waldon	819	88	907	58
17	R.C.Brown Leghorns	S. P. Giles	797	106	903	59
64	Golden Wyandottes	C. L. Sharman	791	89	880	60
4	White Leghorns	Jas. Bridgen	754	107	861	61
9	..	Sylvania Stud Farm	749	98	847	62
15	..	J. Shaw	721	85	806	63
			62,722	7,385	70,107	

REMINDERS FOR APRIL.

Live Stock.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. *Their mouths and feet should be examined and attended to where necessary.*

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows may now be spayed.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply *sows liberally with grain. Castrate young boars.*

SHEEP.—Where early lambs are being bred for local markets, transfer ewes with lambs at foot to best feed as soon as dropped. Castrate ram lambs when a few days old; defer tailing them until ewe lambs are ready. Continue feeding in-lamb ewes until sufficient green feed comes. After first rain (when dust is settled) clear wool from the eyes of young merino sheep and from udders of stud ewes about to lamb; whilst yarded put weak weaners into hospital paddock, and all unprofitable woolled sheep into fattening paddock.

POULTRY.—Do not feed much grain this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the *hens get the better they moult. Remove all male birds from pens.* Add Douglas mixture to drinking water. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit shell and charcoal should always be available.

Cultivation.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Prepare and plough land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape *Barley; ½ bushel, Tick Beans; ½ bushel, Vetches.* Sow *Giant Drumhead Cabbage* for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, Turkestan, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from *trees as soon as all fruit is gathered.*

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean *out asparagus beds wherever the seeds are ripening.*

VINEYARD.—Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of vinegar flies (*Drosophila funebris*). If present, destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors &c. See February *Journal*, 1914.

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ON THE ASSIMILATION OF SOIL CONSTITUENTS BY OATS.

By John W. Paterson, B.Sc., Ph.D., Experimentalist, and P. R. Scott, Chemist for Agriculture.

Ordinary farm crops draw the great bulk of their substance from the atmosphere. A 45-bushel crop of oats (grain and straw) will weigh about 4,725 lbs., and will be formed chiefly from the atmosphere. It must, however, draw certain constituents from the soil. There are seven of these. In a crop of the size mentioned, the soil constituents will, on the average,* amount to—

Nitrogen	52 lbs.
Sulphur	8 lbs.
Potash	46 lbs.
Lime	12 lbs.
Magnesia	9 lbs.
Phosphoric acid . .	19 lbs.
Iron oxide	*trace*

These are the essential soil constituents for plant growth. Wheat and barley have very similar requirements to oats.

As each soil constituent named is essential, it follows that absence of any one of them would mean crop failure. Again, if any one is present, but in a deficient amount, the crop will be deficient likewise, but in a varying proportion. Manures are employed to make good such deficiencies in one or more of the essential soil constituents of plants.

Solubility of Soil Constituents.

In practice a soil is never deficient in any of the seven essential soil constituents because it does not actually contain enough. As a fact, soils usually contain 100 or more times more of each constituent than is required to produce one crop. The deficiency in soils is of another kind. Each material of plant food has to be taken from the soil in solution, and in the case of some of them there may be a deficiency in so far as the soil supply is not in an available form. The material may be too insoluble for the crop to take it up.

* Warington—*Chemistry of the Farm.*

In order to be available for plant growth, a soil constituent need not be actually soluble in water. The roots of living plants develop acid conditions under which insoluble soil material may be gradually brought into solution. The process naturally takes time. On this account it is clear that a crop with a long absorbing period will be in a better position to obtain its necessary soil ingredients from insoluble materials than one whose feeding period is short. And in accordance with this it is found that summer crops in moist districts require heavier manuring than slow-growing crops sown in the autumn.

The Factor of Time.

Time is an important factor when we consider the power of a crop to obtain the relatively small quantities of essential materials which are derived from the soil. It is thus useful to know whether a crop continues to draw upon the soil for its necessary supplies all through the growing period, or whether perchance the demand must be supplied during the earlier part of its existence. To investigate this problem for oats is one aim of the present experiments.

Plan of Investigations.

By permission of the Chairman of the Geelong Harbor Trust and arrangement with the Farm Manager the crop used in the investigations was grown at the Trust's Farm, Sparrovale, Geelong, during the same season and in the same field as the bare-fallow experiments which were previously reported.* The method of working was as follows:—A uniform patch of a crop was selected in a field of oats when the plants were about 15 inches high. Samples of the crop, including roots, were taken for analysis at the following dates:—

	Date.	Stage of Crop.
First harvest ..	2nd November ..	Just before flowering.
Second harvest ..	23rd November ..	Plants well into ear; lower leaves turning yellow.
Third harvest ..	14th December ..	Crop ripening.

The samples were forwarded the same day to the laboratory. They were then divided into the following parts:—

1. Roots.
2. Straw, including stems, leaves, floral axes, and chaff.
3. Grain, including flowers or fruit with the poles.

Before making this separation the base of the stems and the roots were well washed in running water in order to free the parts from any adhering dust or grit. They were then air-dried, and the separation into roots, straw, and grain was made as described.

In each of the three divisions of the plant the following determinations were made at each harvest:—

1. Nitrogen.	3. Lime.	5. Phosphoric acid.
2. Potash.	4. Magnesia.	6. Silica.

These include the seven essential soil constituents already mentioned except sulphur and iron which are required in small amounts and are therefore not practically important. Silica has been estimated because although not an essential it is always present in large amount in ordinary soils. The results found were calculated on the

* *Journal of Agriculture*, Victoria, September, 1912.

samples dried at 100° C., and as such are stated in the subjoined tables. The figures give the percentages. The analyses were made by Mr. W. C. Robertson, Chief Deputy Chemist to the Department.

PERCENTAGE COMPOSITION OF THE CROPS.

Table I. gives the percentage of each constituent in the grain at the second and third harvests:—

TABLE I.

Harvest.	Nitrogen.	Potash.	Lime.	Magnesia.	Phosphoric Acid.	Silica.
Second ..	1·564	·305	·109	·220	·550	·468
Third .	1·626	·377	·084	·216	·490	1·280

Analyzing the materials.

At the first harvest the crop was not in ear. At the second harvest the grain had not commenced to fill, and is chiefly notable for its high content of phosphoric acid. For the rest, the results can best be considered in connexion with the whole plants.

Table II. gives the percentage of each constituent in the straw:—

TABLE II.

Harvest.	Nitrogen.	Potash.	Lime.	Magnesia.	Phosphoric Acid.	Silica.
First ..	1·74	·809	·167	·268	·325	·807
Second ..	·94	·431	·181	·270	·232	·790
Third ..	·76	·265	·157	·237	·110	1·155

It is apparent that important changes took place in the composition of the straw as it approached maturity. The percentage of potash, nitrogen, and phosphoric acid decreased in a marked degree; lime and magnesia remained fairly constant, while silica made considerable increase.

Comparing the straw at the final harvest with the grain at the same time, the grain is much richer in nitrogen and phosphoric acid than the straw. Selling grain thus robs the farm of these important constituents and the losses must ultimately be made good. Magnesia was fairly evenly distributed in the plant, while lime was chiefly found in the straw. Being long oats of the Algerian variety, the grain here contained a good deal of silica. The results for grain and straw may be regarded as generally typical.

Table III. gives the percentage of each constituent in the dry roots of the crop:—

TABLE III.

Harvest.	Nitrogen.	Potash.	Lime.	Magnesia.	Phosphoric Acid.	Silica.
First ..	1·23	·113	·236	·315	·061	1·78
Second ..	1·18	·254	·321	·430	·112	2·70
Third ..	1·05	·745	·460	·342	·244	5·28

When lifting the roots the soil was hard, and although water was freely used it was impossible to obtain more than an unknown fraction of the total roots. In most of the constituents, as the figures show, there was a well-defined tendency for the roots to become richer as they became older. The high figures, indeed, for phosphoric acid, and still more for potash, at the last harvest, are surprising, and will be referred to later on in connexion with an actual loss of mineral substances from the plant in its final stages of development.

THE RESULTS BY WEIGHT.

The above tables deal with the percentage composition of separate divisions of the oat plant. For our present inquiry such figures have less obvious importance than the question of how much of each constituent by weight was present in the entire plant at the different harvests. This aspect of the question can be most easily viewed by bringing the results to lbs. per acre.

In order to be able to do this, the following method was adopted:—At each date of harvesting, an area of 2 square yards was carefully cut off close to the crown of the roots and forwarded to the laboratory in a separate parcel. After drying, the grain was detached, and the weight of dry straw and dry grain obtained calculated to yields per acre. Weight of dry roots per acre was estimated from the ratio of roots to straw found in the samples raised for analysis. The following results were obtained at the different dates of sampling, and refer to lbs. of dry matter per acre:—

TABLE IV.

Harvest.	*In Grain.*	*In Straw.*	In Grain + Straw.	Maximum of Grain + Straw = 100.	In Roots.	In Total Crop.	Maximum Crop = 100.
First ..	..	2,338	2,338	59	449	2,787	64
Second ..	270	3,160	3,430	87	480	3,910	89
Third ..	*1,019*	*2,940*	*3,959*	*100*	*415*	*4,374*	*100*

The crops taken for weighing were at each harvest cut from a strip selected for its uniformity at the time of the first harvest. The figures relating to root-matter per acre are uncertain, for reasons already explained. In the table, grain and straw are stated separately and also together, first in lbs. per acre and then relatively to the maximum yield. Roots are stated separately and also along with total crop, the latter both in lbs. per acre and also relatively to the maximum yield. On studying the table it is seen that the inclusion of roots does not greatly alter the relative yields of dry matter obtained at the different harvests when the roots were excluded from the estimate.

TABLE V.

Harvest.	In Grain.	In Straw.	In Grain + Straw.	In Max. Grain + Straw = 100.	In Roots.	In Total Crop.	In Max. Crop = 100.
			NITROGEN.				
First ..	..	40·8	40·8	100	5·5	46·3	100
Second ..	4·2	29·6	33·8	83	5·7	39·5	85
Third ..	16·6	22·3	38·9	95	4·4	43·3	94
			POTASH.				
First ..	..	18·9	18·9	100	·5	19·4	100
Second ..	·8	13·6	14·4	76	1·2	15·6	80
Third ..	3·8	7·8	11·6	61	3·1	14·7	76
			LIME.				
First ..	..	3·9	3·9	65	1·1	5·0	67
Second ..	·3	5·7	6·0	100	1·5	7·5	100
Third ..	·8	4·6	5·4	90	2·0	7·4	99
			MAGNESIA.				
First ..	..	6·5	6·5	71	1·4	7·9	71
Second ..	·6	8·5	9·1	99	2·0	11·1	100
Third ..	2·2	7·0	9·2	100	1·4	10·6	95
			PHOSPHORIC ACID.				
First ..	..	7·6	7·6	86	·3	7·9	85
Second ..	*1·5*	*7·3*	*8·8*	*100*	·5	9·3	*100*
Third ..	5·0	3·2	8·2	93	1·0	9·2	99
			SILICA.				
First ..	..	21	21	45	8·0	29	42
Second ..	1·3	25	26·3	56	13·0	39·3	57
Third ..	*13·0*	*34*	*47*	*100*	*21·9*	*68·9*	*100*

STAGES OF GROWTH AT WHICH SOIL CONSTITUENTS ARE ABSORBED.

An important point in connexion with the absorption of the essential food constituents by plants is to know whether it is continuous throughout the entire vegetative period. Calculating from Table IV. and the percentage tables above, it can now be determined at what date the maximum of each plant food was present in the crop. The results are stated in Table V. as lbs. per acre.

Table IV. showed that the maximum production of dry matter (crop yield) was obtained at the third harvest. Table V. now shows that in the case of each essential soil constituent the maximum absorption had been accomplished some time earlier. Apparently, for each constituent the crop had finished with the soil as a source of plant food for some considerable time before it finished growing. The same conclusion is reached whether the roots be included or only the above-ground parts of the crop. Silica, indeed, continued to be absorbed up till the final harvest; but silica, although a bulky constituent in the ash of cereals on most soils, is not a necessary food constituent of plants.

The important soil constituents from the agricultural stand-point (because they are the hardest to get) are nitrogen, potash, and phosphoric acid. *Two of these, viz., nitrogen and potash, apparently* cease to be absorbed by the oat crop about the time of full bloom. Phosphoric acid continues to be absorbed somewhat later, and the same is true for lime and magnesia. Silica is absorbed as long as the plant is green.

BEARING OF THE RESULTS UPON FARM PRACTICE.

The early cessation of nitrogen and potash absorption, as indicated in the table, points to the need of an easily available supply of these food materials for the young plant. Fortunately, Victorian soils are generally well supplied with available potash, but there may frequently be a deficiency of available nitrogen. As was recently pointed out in connexion with bare fallowing, this deficiency is most likely to occur where one crop follows immediately upon another without a period of fallow, and when the season has been dry. If such deficiency is discovered after the crop is 6 or 8 inches high, an application even of nitrates will be too late to exercise much good effect.* *The early demands for potash and nitrogen made by the oat crop render it* more necessary for soils to be well supplied with these constituents than would otherwise be the case, and must increase the liability to nitrogen starvation on the poorer classes of land.

The later date to which phosphoric acid is absorbed, as seen from the table, favours the action of phosphatic manures as compared to those supplying nitrogen, because their time of action is more prolonged.

LOSS OF ABSORBED CONSTITUENTS BY OATS.

It is in the earlier stages of vegetation that the more important soil constituents are absorbed. The figures of Table V. incidentally raise another point. During the later stages of plant development

* *Journal of Agriculture*, Victoria, September, 1912.

there has apparently been a loss of soil constituents previously taken in by the crop, and it seems possible that the manurial requirements may in consequence be greater than the analysis of the mature crop would indicate.

This loss of absorbed material is greater with some constituents than with others. The loss is strongly marked with potash; it is present but less apparently with nitrogen, while with phosphoric acid it is so insignificant as to fall within the limits of experimental error. With potash, 39 per cent. of the potash previously absorbed was lost from the "straw + grain," while from the whole plant (roots included) 24 per cent. was lost. From an anomaly apparently present in the potash content of the roots at the third harvest, and already referred to, the last figure probably under-rates the eventual loss. Similar results with wheat and barley showing a loss of potash, and in a lesser degree of nitrogen, were obtained by Wilfarth,‡ and the indications are that in cereal crops this loss of absorbed material may be of normal occurrence. Wilfarth found little or no loss of absorbed phosphoric acid.

SUCH LOSSES NOT GENERAL TO CROPS.

From a number of experiments in various parts of the world, it would seem that this loss of absorbed plant food does not occur in all varieties of crops. Wilfarth did not find it in potatoes grown on the same soil as his wheat and barley. André¶ did not find it with beans white lupins, or pinks. Another observer failed to find it in sugar-beet. Outside evidence, therefore, points to the conclusion that such losses may be characteristic of some crops but not of others.

WHY SHOULD CROPS VARY?

Why should crops behave differently in this respect? So far as we can discover, no satisfactory explanation has been offered, but the facts suggest one which to some extent meets the case. The high content of potash in the oat roots at the third harvest has been referred to, and if the losses occur into the soil through the roots this would, no doubt, account for a temporary surfeit of potash in these organs during the course of its downward passage. The absence of mineral losses noted by Wilfarth in potatoes, and by another in beets, does indeed suggest a reason why oats should behave differently from root crops as they approach the ripening stage. The latter retain their natural sap on reaching maturity as farm crops during the first year of growth, but an oat crop loses the greater part of its moisture on ripening; and it is possible that the consequent concentration of the absorbed salt solutions within the plant tissues induces a downward diffusion of absorbed salts in order to establish equilibrium with the soil solution outside. About 10,000 lbs. of water would be lost by the present crop as the result of ripening. As the roots of oats (an annual) die off on reaching maturity, the process of outward diffusion presumably comes under the operation of purely physical laws, and is not subject to physiological control. The fact that phosphoric acid is not lost on reaching maturity,

‡ *Die landw. Versuchsstationen*, Vol. lxiii. 1905.
¶ *Compt. Rend. Acad. Sci.* (Paris) 151 (1910), No. 26.

like potash and nitrogen from the oat plant, might be ascribed to the ready precipitation of unused phosphoric acid as insoluble phosphates within the tissues of plant.

Was the Lost Material of Use?

Were the important nitrogen and potash absorbed by the oat plant, and afterwards excreted, of any use to the plant during their temporary sojourn in its tissues? This is an important point in connexion with this matter. Wilfarth found that in barley crops poorly nourished with potash the quantity of potash returned to the soil was relatively, although not absolutely, greater than where the plants were fully nourished with potash. This might, indeed, indicate that the transitory potash had been of use, but our present experiments furnish no evidence on the point, and it is unsafe to found conclusions upon a single experiment conducted elsewhere. This is particularly true when we reflect that the potash *could* be absorbed without performing useful functions. Plants can absorb soluble ions of any non-essential and unusual metals such as copper and manganese, and *in the same way they can absorb an unneeded surplus of potassium* if it is offered to them, and this unneeded potassium might naturally diffuse back to the soil as the crop dried out. Under field conditions with oats this is probably the rule.

Did it Impoverish the Soil?

If the nitrogen and potash excreted from the ripening oats did not perform any useful function in the plant, neither can they be supposed to have involved any extra drain upon the resources of the soil. *Any loss by excretion from the roots would be in a form readily* available for use by subsequent crops.

We desire to thank Mr. Baird, Manager at Sparrovale, for his co-operation in carrying out these experiments.

Summary.

1. The oat crop forms about 95 per cent. of its substance from the air.

2. The necessary soil constituents form only a small part of the crop by weight.

3. Seven soil constituents are essential.

4. Each of them is absorbed in solution.

5. "Deficiency" in any constituent means deficiency in a soluble form.

6. In such a case the crop will also be deficient.

7. With most of the soil constituents the acid reaction of living roots helps in their solution.

8. This solvent action requires time.

9. *Nitrogen and potash cease to be absorbed by the oat plant about* the time of full bloom.

10. This fact renders a larger available supply of these constituents necessary at seed-time than would otherwise be the case.

11. The absorption of phosphoric acid continues to a later stage of vegetation.

12. This fact is in favour of the action of phosphatic manures.

13. Silica is absorbed still later than phosphoric acid, and as long as the plant is green. Silica is not a plant food.

14. Little or none of the phosphoric acid absorbed is afterwards lost to the plant.

15. These experiments show that a good deal of the absorbed nitrogen and still more of the potash may be lost.

16. It is not clear that the lost substances were useful, although such losses are probably inevitable in oats grown under field conditions.

17. Materials absorbed and excreted by the plant impose no extra drain upon the soil for subsequent crops.

DAIRY SUPERVISION ACT.

A conference of representatives of the Victorian Chamber of Agriculture and of the Co-operative Butter and Cheese Factories Association of Victoria was held on Friday, 27th February, 1914, pursuant to notice.

Mr. John Zwar was voted to the chair, there being nine other delegates present.

The notice convening the conference was read by the secretary of the Chamber of Agriculture (Mr. H. Schwieger) who explained the attitude of the Council of the Chamber of Agriculture in regard to the extension of the Milk and Dairy Supervision Act and the improvement of dairy produce generally.

The conference affirmed the principle of effective dairy supervision, either Government or municipal, and also favoured the idea that the Government should be urged to extend the Milk and Dairy Supervision Act into those districts in which there is now no effective system of inspection.

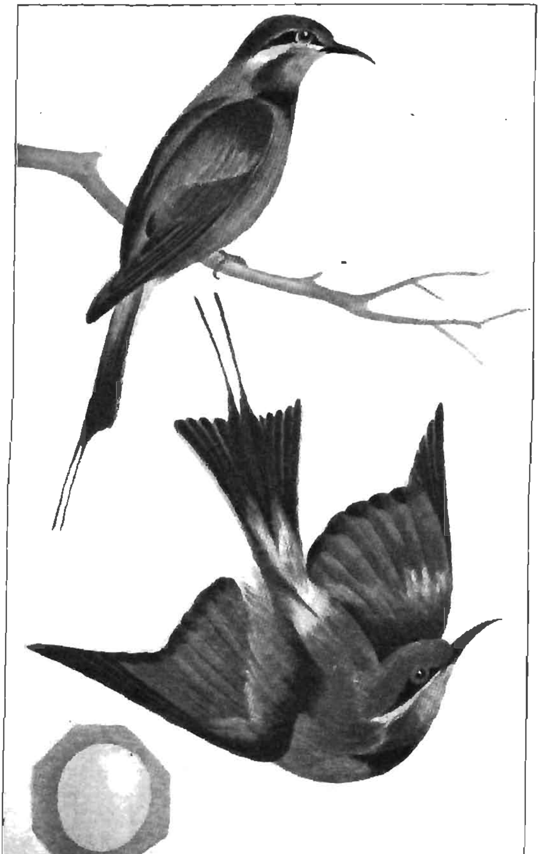
In order to give effect to this resolution, the chairman moved, and Mr. McCullough seconded, that the following words be deleted from clause 7 in the Milk and Dairy Supervision Act: "which on the request of such Council has been proclaimed as a district subject to the provisions of this Act or if so requested in writing by the Council thereof." The motion was carried unanimously.

The conference was also of opinion that Victorian butter is not of the same high standard as was the case a few years ago.

They attribute this decline in quality to the fact that managers of butter factories do not insist upon the cream being delivered at the factories at sufficiently frequent intervals.

Mr. Burke moved, and Mr. McCullough seconded, "That the Government be urged to bring in a Bill to provide for the compulsory grading of cream." This motion was carried unanimously, as was also a motion moved by Mr. Cook, and seconded by Mr. Rankin, "That all factory managers should by examination be proved to be in possession of the necessary qualifications for the position."

It was further resolved to convey these resolutions to the Director of Agriculture (Dr. S. S. Cameron).



The Australian Bee Eater (Merops ornatus).

BEE-KEEPING IN VICTORIA.

(*Continued from page 179.*)

By F. R. Beuhne, Bee Expert.

XXI. ENEMIES OF THE BEE—*continued.*

Birds.

The Australian Bee Eater (Merops ornatus).

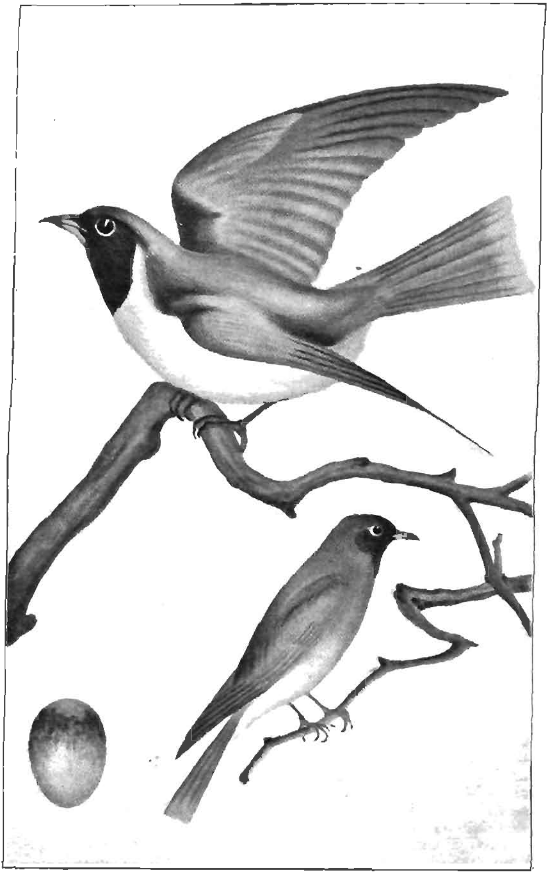
As a destroyer of bees this bird holds pride of place. Mr. C. French, in the *Journal of Agriculture* of February, 1902, says: This beautiful bird is unlike any other of our Australian birds, and cannot easily be mistaken. The general plumage of this bird is a beautiful golden green and azure blue, the feathers of the throat being of a rich yellow. Length of bird, according to Mr. Campbell, 10 inches, including tail, 6 inches, and bill 1½ inches, the tail feathers assuming a peculiar shape and colour. The habits of this bird are partially migratory, and the birds are to be found in the northern parts of Victoria. They appear in September, and, according to Mr. Campbell and other ornithologists, leave again in March. The eggs, usually five in number, are deposited in holes made mostly in the sandy banks of rivers.

The bee eater, as its name implies, has a bad reputation as a destroyer of bees, but the strictly insectivorous nature of the bird renders it, with all its faults, much more valuable than many people think. I have seen the holes in which the young are reared strewed with the remains of beetles, plant bugs, moths, &c., and but very few bees; but these latter the parent birds may dissect before feeding their young. The bee eater is one of the most beautiful of our indigenous birds, and, when on the wing, has somewhat the flight of our well-known and much-esteemed wood swallows or summer birds.

The Wood Swallow (Artamus personatus).

Wood swallows, of which there are several species, are much more numerous than bee eaters, and although each wood swallow will, perhaps, eat less bees and more other insects than a bee eater, the aggregate damage done to the beekeeper by wood swallows is much greater than that done by bee eaters. On cool days, when few other insects than bees are about, hundreds of wood swallows will sometimes keep in the vicinity of an apiary for days catching the bees which come out for water, and thus deplete the colonies of adult bees at a time when they can ill be spared. These birds, after catching a bee, alight somewhere and break the bee in two, the abdomen, with the sting, being discarded. On this account a much greater number of bees is required to feed the bird, and the absence of the abdomen of the bee, with its distinguishing coloured rings, in the craw of birds shot and dissected, has led superficial observers to the belief that these birds do not eat bees.

Mr. C. French, in the *Journal of Agriculture* for May, 1902, says of the Masked Wood Swallow, the species illustrated herewith: The male of this species has, according to Gould, the face, ear coverts, and throat jet black, bounded with a narrow line of white, crown of the



The Wood Swallow (Artamus personatus).

head sooty black, gradually passing into the deep grey which covers the whole of the upper surface, wings and tail, the latter tipped with white; all the under surface very delicate grey, thighs dark grey; iridis blackish brown; bill bluish at base, becoming black at the tip; legs and feet bluish grey. The female differs principally in having the colouring of the bill and the black mark on the face much paler.

The nests of the wood swallow are frail, and somewhat carelessly built of small twigs and fibre, and in the case of the Masked Wood Swallow half-dried grass is often used as a lining. The nest is built mostly in low trees and bushes, and contains two to three eggs.

There is a number of other birds which eat a few bees occasionally, or take to it as a freak. In the first case the damage done is insignificant, while in the latter the killing of the one or more individual birds will supply the remedy.

Ducks.

Ducks and bees are mutually destructive; that, at least, is the writer's experience. Adult ducks, when once they take to eating bees, cannot be cured of the habit. In the case of young ducklings the evil supplies its own remedy, for, sooner or later, a sting will lodge somewhere in the bird's anatomy, and cause what an uninitiated onlooker would take to be a fatal fit. Adult ducks do not seem to be affected in any way, no matter how many bees they swallow at waterholes where bees come to drink, or which they catch on low flowering plants such as dandelions and clovers. Quite early in his bee-keeping experience the writer was compelled to dispense with ducks, for they would do little else than eat bees from morning to evening. Fowls do not in any way interfere with bees, nor bees with fowls. When insect food is scarce, fowls will eat dead bees, and sometimes drones, but I have never known them to eat live workers.

XXII.—WINTERING BEES.

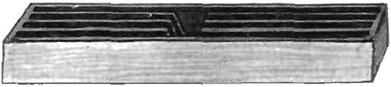
At the end of the honey season every bee-keeper should make a thorough examination of his stock to ascertain whether each colony has a fertile queen, a sufficient force of worker bees, and enough honey to carry him through till September or October. To get bees successfully through the winter months is a most difficult problem in North America and Northern Europe, especially where the rigour of the climate makes cellar-wintering almost a necessity.

In Australia, we have no such difficulties, and in consequence bee-keepers pay too little attention to the subject of wintering so far as the condition of their colonies at the beginning of winter is concerned. Yet it is the condition of a colony, as to quantity and quality of stores, age and vigour of queen, and number of worker bees at the end of one season, which largely determines the prosperity of, and the yield of honey from, that colony in the season following.

The first consideration is the amount of honey required by each colony for its winter use. This varies according to the strength in bees, the conditions of weather during winter, and the earlier or later presence in spring of nectar and pollen-producing flowers. On an average each colony should have from 25 to 30 lbs. of sealed honey to winter normally. When, as sometimes happens, the brood combs contain considerably less than that quantity, it will have to be supplemented either

by substituting combs of sealed honey for the outer empty combs of the brood chamber, or by feeding sufficient honey or sugar syrup to bring the total quantity up to requirements.

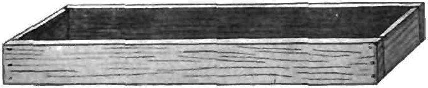
Giving combs of sealed honey, which have been put by for that purpose during the season, is the easiest way of supplementing winter stores, but it should not be practised unless the apiary is, and has been for some time, entirely free from foul-brood, as in this interchange of combs there is always a risk of spreading disease. When, owing to the absence of a stock of sealed honey, or on account of a suspicion of disease, it becomes necessary to feed, sugar syrup is much to be preferred to honey. Honey, although it is the natural food of bees, excites them much more than sugar syrup. There is also the risk of introducing the germs of brood diseases with honey of unknown origin, while its stronger odour may attract bees from other hives, and thus cause trouble by starting robbing.



1. Simplicity Feeder.

Feeding should always be done inside the hive in a properly constructed feeder. In the case of colonies which do not cover all the combs of the brood chamber, some of the outside combs may be removed before feeding is commenced, so that the whole of the syrup given will be stored in as few combs as possible, and where it will be covered by the cluster of bees, and thus prevented from souring.

Sugar syrup is made of two parts (by weight) of 1A sugar and one part water. The water is brought to boiling point and the sugar added, keeping the vessel on the fire and stirring continuously till the liquid is perfectly clear. On no account should the syrup be left on the stove or fire without stirring, as it burns very easily, and in that state is injurious to bees



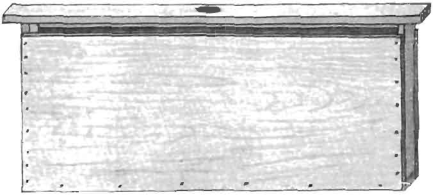
2. Home-made Feeder.

To supply this syrup to the bees without waste and drowning it is necessary to have a feeder. Fig. 1, known as the simplicity feeder, may be purchased of a supply dealer at 4d. It is a block of wood, grooved out so as to leave narrow divisions to prevent bees getting drowned. This is the most convenient form of feeder for box-hives. The box is raised at one end, the feeder placed on the floor board, and the syrup poured in while still warm; the box is then lowered again. If a stock of bees is quite out of stores, at least 5 lbs. of syrup should be given and more later on, if required. It will be better to give the syrup as fast as the bees will take it than to continue feeding for days; for the longer the excitement lasts the more food is consumed without purpose.

As the simplicity feeder is rather small, several may be used under each box so as to shorten the time; or a home-made feeder may be used, such as shown in Fig. 2. It is a plain shallow box and may be made of any size that the dimensions of the covering hive permit. To prevent leakage, hot wax should be run along all the inside joints, while a thin board cut slightly smaller than the inside of the box will float on the syrup and prevent drowning of bees.

Both of these feeders may be used for frame-hives also: in which case they are placed on top of the frames with an empty half super or section super between the hive and the cover. When feeding is finished, feeders and half supers should be removed and the hive roof again put directly over the frames to conserve the warmth rising from the cluster of bees.

The most convenient feeder for frame-hives is that shown in Fig. 3. It is simply a frame boarded up to near the top bar, with a hole in the latter through which the feed is poured. It should be waxed inside to prevent leaking and have a strip of wood for a float. This feeder takes the place of an ordinary brood-frame in the hive to be fed. All that is necessary is to raise the hive cover and pour the syrup through the hole in the top bar. It is sold, waxed ready for use, at 1s. 6d.



3. Most Convenient Feeder for Frame-hives.

Colonies fed during winter cannot be given sufficient food for breeding up in spring, but only enough to carry them along till warmer weather. They should therefore be examined periodically whenever a fine day permits, and another dose of syrup given when needed. When pollen is being carried into the hives, a sign that brood-rearing has commenced, the stores of syrup will be consumed much faster, and care should be taken that after bringing the bees through the winter they do not succumb to starvation in early spring.

In Victoria, the necessity for winter feeding rarely occurs, unless hives have been robbed or extracted without regard to the winter requirements of the bees

Packing of hives, as practised in colder countries, is not necessary here, but upper stories of empty combs should be removed from the hives, taken indoors, and stacked up and secured against bee moths. The removal of all spare combs and boxes does not only prevent loss of animal heat by radiation, and the unnecessary consumption of stores to replace this loss, but it also compels the bees to store any thin honey, which they may still gather, into combs covered by bees; it will there ripen, instead of souring as it does when stored in combs outside the cluster of bees. Watery honey, when consumed during inactivity, is without doubt detrimental to bees, particularly when it contains such a high percentage of

nitrogenous matter, as is present in the honey from our winter-flowering iron-bark trees. The consumption of watery food during winter causes ordinary dysentery, and probably also provides a suitable medium for the multiplication of the *Nosema apis* parasite and the growth of fungi in the intestinal tract. At the same time, the more rapid accumulation of fæcal matter in the intestine compels the bees to take cleansing flights during unsuitable temperatures, resulting in loss through chilling and failure to return to the hive.

Methods of wintering differ with bee-keepers, and also in localities. Some leave the supers on the hives whether full or empty, others put the empty stories underneath the brood chamber, while yet others remove the supers altogether and shut the bees down on the combs of the single brood chamber.

4. Apiary Showing Hives Shut Down for the Winter.

With a favorable winter and colonies strong, there is little, if any, difference between the three methods. But colonies are not always strong at the end of the honey season, and the character of the coming winter cannot be anticipated. It is therefore best to take no risks, but shut the bees down to a single story, which will give the best results under all the varying conditions of strength in bees and climatic influences. When colonies are left with one super full of ripe honey, in addition to the brood chamber, they winter well. But not many bee-keepers are prepared to leave so much honey in the hives, which is not needed by the bees and represents in a large apiary a considerable money value which cannot be realized till the following spring. At the same time, there is a risk of some of the honey granulating in the combs, and then it cannot be obtained except by the destruction of the combs.

When supers with empty combs are left on, the heat generated by the cluster of bees escapes upwards and the bees sometimes follow it and establish their seat between the empty combs. Some of the honey is carried up by this means and the operation causes unnatural activity, greater consumption of stores, and wearing out of bees.

With the empty combs put below the cluster of bees, the same advantages of conserving heat and ease of occasional examination are secured, as when bees are wintered in a single hive body. But combs below the brood are apt to become rather dirty, and sometimes mouldy.

Since it has become known that the *Nosema apis* parasite is present in almost every apiary, there is an additional reason for the removal from the hives of all combs not required by the bees during winter. According to Dr. Zander, the discoverer of *Nosema apis*, the chief source of infection is the combs soiled with the fæces of diseased bees. During the working season, bees void their excrements outside the hive; moreover, the life of the bee during active field work in summer is so short that infected bees wear out in the natural course of events before the disease has reached the final stage, as in the case of bees which came through the winter.

The removal of all surplus combs, at the end of the season, will therefore do much to keep them free from the infection, which undoubtedly would take place during winter should an outbreak of malignant dysentery occur. Thus, only one set of combs would have to be boiled down, instead of two or more In the case of small colonies, the reduction can be carried still further. The writer has repeatedly successfully wintered bees on three or four combs by confining them to one side of the hive (the side facing the sun) by means of a division board, or by putting two small stocks into one hive, a thin tightly fitting board and a separate entrance for each, keeping them apart.

This crowding of bees on a limited number of combs has also the advantage of being a preventive of robbing. Robbing generally gets started, in the first instance, by bees prowling round and finding honey in the unguarded outside combs of a colony. Becoming bolder, by degrees, the robbers will attack any poorly defended hive. Bees from other hives, attracted by the commotion, join in and share in the plunder. As colonies affected with foul brood are poor defenders of their home, such a colony, if one is in the apiary, usually falls a victim to the robbers and the robbers in turn develop disease in their hives. Combs removed from the hives should be at once secured from access by bee moths, by tiering the cases and securely covering the top and bottom of each stack. It is during the autumn that the wax or bee moth deposits its eggs on the combs, although the grubs do not appear till spring. Often the bee-keeper is unaware that the eggs were present when he carefully packed away his combs, after leaving them exposed to the moths for a little time.

(To be continued.)

STREET SWEEPINGS AS MANURE.

Attention is drawn in a Yorkshire paper to the danger of using, on land, sweepings from tar-sprayed roads or streets. A specific instance is mentioned in which a turnip crop, dressed with road sweepings, turned out a total failure, the crop not being worth gathering.—"Fertilisers," November 29, 1913.

PLANTING AND RECONSTRUCTION OF VINEYARDS.

CONDITIONS GOVERNING THE DISTRIBUTION OF PHYLLOXERA-RESISTANT VINE ROOTINGS AND CUTTINGS.

In order to guard against misunderstandings, such as have occasionally arisen in the past, concerning the conditions subject to which intending planters of vineyards may purchase phylloxera-resistant vines from the Department of Agriculture, it is deemed advisable, in the present issue of the *Journal*, to clearly state these conditions

Similar information, published early last year, proved most useful, and was the means of preventing confusion.

It may not be out of place to here remind applicants that the Department is situated very differently from a private nursery firm, which conducts its operations for profit. The propagation and grafting of resistant stocks were undertaken solely in order to help the Victorian vine industry through the phylloxera crisis, by which it was threatened with extinction. Numerous difficulties have had to be surmounted, and considerable sacrifices have been made, vines being supplied to growers at a price which amounts to less than half of what it costs to raise them. In order to prevent disappointment, and to insure the help and co-operation of growers, conditions have been drawn up which intending applicants are earnestly requested to thoroughly familiarize themselves with. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed below, nor can any request for special consideration be entertained.*

While every care will be exercised to supply vines and vine cuttings true to name, no pecuniary liability can be incurred by the Department in the event of possible error. Vines (including cuttings) will only be despatched subject to such reservation.

Resistant vines are supplied to intending planters in either of the following forms, and at the prices stated:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £4.

Resistant rootlings, ungrafted, at per 1,000, £1

Resistant cuttings, at per 1,000, 10s.

The conditions which applicants have to comply with necessarily vary for each of these. Before detailing them, the two methods by which a vineyard on resistant stocks can be established may be briefly outlined, mainly for the information of settlers in new districts. These are—

I. Field grafting of resistant rootlings, planted the year before.

II. Planting of nursery-raised grafted rootlings or bench grafts.

Field grafting implies the planting of the vineyard with ungrafted rootlings, which are grafted, the year following their plantation, with scions of the vine variety it is desired to obtain fruit from. Sometimes cuttings are planted instead of rootlings, but unless the season be a very favorable one, results are usually disappointing.

Plantation of Grafted Rootlings.—The term "bench graft" is due to the grafting being performed at a bench or table, in a workshop; the resistant cuttings thus grafted with European scions being subsequently callused in artificial heat and struck in a nursery

Field grafting is the older method. In Europe it has been very largely superseded by the plantation of grafted rootlings, a more even vineyard being thus obtained in climates where a cold Spring is the rule; cold, wet weather causing many field grafts to fail. In the more temperate climate of Northern Victoria far more satisfactory results can be relied on, and field grafting can be confidently recommended to intending planters. Some practical vine-growers who have tried both methods on a large scale claim to have obtained equal, if not better, results from field grafting.

A common fallacy concerning field grafting must here be corrected. It is often thought by intending planters that they gain a season by planting already-grafted vines. This, however, is not the case. The already-grafted vine cannot bear fruit before the third season from plantation. The field grafted vine commences to bear fruit the second season from grafting. If planted on properly prepared land, field grafting can be executed the season following plantation; it therefore follows that such vines will commence to bear the third season from planting, or just as soon as the already-grafted vines, planted at the same time.

SELECTION OF SCIONS.

Scions for bench-grafting must be supplied by applicants for grafted rootlings, as will be pointed out presently; but it is well to here urge on intending planters the very vital importance of careful selection of scions, whether these be intended for bench or field grafting.

The improvement of the fruit-growing capacity of a variety by means of careful selection of cuttings is no new discovery; it has repeatedly been recommended by different officers of this Department,* and its importance is now very generally recognised. It is a point, however, which was for many years much neglected by the majority of Victorian vine-growers, with the result that several of our vine varieties show more or less marked deterioration in their yield of fruit.

In order to secure prolific scions, the best individual vines in a block of any given variety should be carefully marked—quality and quantity of fruit, as well as general health and vigour, are the essential points to be considered in the selection of these scion-bearing vines, which may best be carried out immediately before vintage. Only fruit-bearing canes on the vines thus selected should be used as scions.

APPLICATION FORMS.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

APPLICATIONS FOR GRAFTED ROOTLINGS FOR DISTRIBUTION, 1915.

(*For the* 1914 *distribution, the time for receiving applications closed on* 31*st May*, 1913, *and present applicants cannot be supplied till* 1915.)

1. For the 1915 distribution (June to August inclusive) applications, on the official forms (see above), must be made before 31st May, 1914, after which date they cannot be entertained.

2. Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H. Adcock, Principal

* See *Journal of Agriculture*, Victoria, 8th March, 1906, page 189.

Viticultural College, Rutherglen. They must be accompanied by a deposit at the rate of £1 per 1,000 grafted rootlings ordered. In the event of the allotment not being equal to the number applied for, the excess deposit will be applied as a progress payment for those delivered.

3. Scions for grafting, to the number of rootlings applied for and selected as described above, must be delivered by applicants at the Wahgunyah Nursery, or at the Wahgunyah railway station, freight prepaid, between 1st and 30th June, 1914. They must be of medium thickness (minimum diameter at small end ¼ inch and maximum at large end ½ inch), and must be delivered in fresh condition and in good order.

4. On orders for small lots (less than 500 of one scion or stock variety) a surcharge must be paid, to cover cost of extra supervision, of 25 per cent. for lots of 100 and over, and of 50 per cent. for lots below 100.

5. Applicants who supply resistant cuttings (stocks) as well as scions will be entitled to the full number of the grafts which strike.

6. Prior to distribution applicants must submit the land they intend to plant to inspection, as no grafts will be distributed unless the Department is satisfied that they will be planted on properly-prepared land.

7. The number of grafted rootlings applied for will, before being approved, be subject of adjustment after inspection as provided in the next preceding rule, and in the event of the approved number applied for exceeding the number available, distribution will be *pro rata* of the adjusted and approved quantities.

8. Applicants must pay the balance of purchase money, as specified above, together with cost of packing (of which they will be notified) before the grafts can be forwarded.

9. The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, these cannot be supplied to growers in clean districts. To do so would be manifestly unfair to owners of existing vineyards in such districts.

APPLICATIONS FOR UNGRAFTED ROOTLINGS.

1. For the 1914 distribution (July and August inclusive) applications will be received until 30th June, 1914.

2. Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H. Adcock, Principal Viticultural College, Rutherglen. They must be made on the official order forms (see above) and must be accompanied by a deposit at the rate of 10s. per 1,000 ungrafted rootlings ordered. Payment in full at the rate of £1 per 1,000, with cost of packing added, must be made before the vines can be delivered. In the case of such final payment not being made the deposit shall be forfeited.

3. Orders for small lots (under 500 of any one variety) to pay a surcharge of 25 per cent. for lots of 100 and over, and of 50 per cent. for smaller lots.

4. Should the number applied for exceed the number available, distribution will be made *pro ratâ*.

5. Rootlings cannot be sent from nurseries in phylloxerated districts to clean districts. A limited number of clean rootlings are, however, available for distribution to clean districts. The price charged is £1 10s. per 1,000, packing extra. Applications for these will be received

by Mr. E. E. Pescott, Principal, School of Horticulture, Burnley, until 13th June, 1914.

APPLICATIONS FOR CUTTINGS.

In the event of not being able to purchase sufficient rootlings (grafted or ungrafted), applicants are reminded that cuttings are available. These may be either planted out immediately in the situation which they are intended to permanently occupy, or they may be previously struck in a nursery; the latter is the course recommended. The distribution of resistant cuttings is subject to the following conditions:—

1. In view of the urgent demand for grafted rootlings, no cuttings of sufficient diameter to be grafted are available for sale. Resistant cuttings of less than ¼ inch in diameter at the small end will be supplied at 10s. per 1,000.
2. Applications for such cuttings, for delivery in July and August, 1914, must be made prior to 30th June 1914, on the official order forms (see above).
3. Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H. Adcock, Principal of the Viticultural College, Rutherglen Payment in full, at the rate of 10s. per 1,000, must accompany the order. This amount to be forfeited if delivery is not taken. Where cuttings are required to be sent a long distance and packing is necessary the cost will be advised and must be remitted prior to consignment.
4. Clauses 3 and 4 of the regulations concerning ungrafted rootlings apply also to cuttings.
5. Cuttings from phylloxerated districts cannot be sent to growers in clean districts. *A limited number of cuttings are available in districts free from phylloxera, and these can be obtained subject to the conditions specified above, but at the increased price of 15s. per 1,000.*

NITRIFICATION AND DENITRIFICATION.

"MODERN SCIENCE AND MODERN AGRICULTURE" was the subject of a lecture delivered on Monday evening at a meeting of the Surveyors Institution by Professor Ainsworth Davis, Principal of the Royal Agricultural College, Cirencester. Professor Ainsworth Davis said that among the results of the scientific study of the soil was the discovery of the bacterial nature of the process of nitrification.

On the other hand, denitrifying organisms were also discovered, and the problem was to destroy the latter without detriment to the former More recently. Dr. Russell and his colleagues at Rothamsted had found that partial sterilization of the soil was followed, after a short interval, by a marked increase in fertility.

The theory put forward was that the soil contained microscopic animals, which preyed upon the nitrifying bacteria. These animal organisms were destroyed by sterilization, which, at the same time, was not sufficient to destroy the bacteria.—"Fertilisers," December 20, 1913.

A matter of general observance is the prolific growth following a grass fire.

TESTING AND CULLING DAIRY COWS IN GIPPSLAND.

By R. T. McKenzie, Dairy Supervisor.

Mr. Jas. Mercer, of Ardlie Farm, Jeetho, is one of the few dairy farmers in the shire who recognises the importance of weighing and testing as the only reliable method of gauging the amount of milk and butter fat production of each cow during her period of lactation. This farm, which is situated between Jeetho and Bena, contains about 100 acres, well grassed with cocksfoot clover and rye. About 12 acres of hay and maize are also grown every year for feeding the cows through the summer and winter. Mr. Mercer has been keeping records for the last three years, and has effected a wonderful improvement in the monetary returns per cow since so doing. The individual records for the past season are appended.

Name.	Lbs. of Milk.	Test.	Lbs. of Butter Fat	Average Price.	Value. £	s.	d.
Flirt	5,728	4·5	257·76	1s.	12	17	9
Gipsy	5,153	5·0	257 65	1s.	12	17	8
Dolly	5,494	4·6	252·72	1s.	12	12	8
Melba	5,064	4·3	217·75	1s.	10	17	9
Queenie	4,365	4·7	205·15	1s.	10	5	2
Hazel	4,372	4·7	205·48	1s.	10	5	6
Madge	3,918	5·2	203 73	1s.	10	3	9
Jean	4,023	4·9	197 12	1s.	9	17	1
Vera	5,127	3·8	194·82	1s.	9	14	9
Model	4,092	4·7	192 32	1s.	9	12	4
Wardie	5,494	3·5	192·29	1s.	9	12	3
Kitty	4,337	4 4	190·82	1s.	9	10	9
Myrtle	3,907	4·7	183·62	1s.	9	3	7
Tibbie	3,903	4·7	183 44	1s.	9	3	5
Molly	3,414	5·2	177·52	1s.	8	17	6
Sparrow	4,661	3·8	177·11	1s.	8	17	1
Eva	4,182	4·4	184·01	1s.	9	4	0
Beauty	4,419	3·9	172·34	1s.	8	12	4
Mousey	4,268	3·8	162·18	1s.	8	2	2
Myra	3,975	4·1	162·97	1s.	8	3	0
Brockie	4,089	4·4	179·91	1s.	8	19	11
Patty	3,013	5·1	153·66	1s.	7	13	7
Clover	3,738	4·1	153·25	1s.	7	13	3
Roany	3,129	4·6	143·93	1s.	7	3	11
Angel	4,214	3·8	160·13	1s.	8	0	1
Olga	3,855	3·6	138·78	1s.	6	18	9
Maisie	2,148	5·7	122·43	1s.	6	2	4

The milk from each cow was weighed daily and tested weekly, and the price for butter fat averaged from the returns from the Korumburra Butter Factory. It will be seen that the best cow brought in a return of £12 17s. 9d., while the return from the worst was only £6 2s. 4d.,

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test 4.61 per cent., yielding 218.45 lbs. of fat, at 1s. per lb. equals £10 18s. 5d. The ten worst averaged 3,684.8 lbs., milk test 4.2, 154.958 lbs. butter fat at 1s. equals £7 14s. 11d. Whilst the ten worst show a return above the average for the State, the figures indicate there is still room for improvement. Both the lowest, Olga and Maisie, have been dispensed with, and two others put in their places. In the past, Mr. Mercer has been replenishing his herd (for the ones discarded) from cows bought in the saleyards. Last year, however, he purchased a pure-bred Jersey bull, which came from Miss Robinson's noted herd, and proposes rearing the calves from the best-known cows, and he confidently expects a great improvement in the average production in the course of a few seasons.

It is regrettable that so few of our dairy farmers do not recognise the utility of individual records, for it is only by this system of registering the record of each cow from day to day that the dairyman is enabled to tell for a certainty which cows are worthy to be retained in the herd and which should be culled.

PAKENHAM HORTICULTURAL SOCIETY.

RESULT OF FIELD COMPETITION (POTATOES).

(*By J. T. Ramsay, Potato Expert.*)

With the object of increasing interest in the growing of potatoes as a field crop, and raising the standard of cultivation and weight per acre, the Pakenham Horticultural Society, in October, 1913, offered three prizes for the best 3 acres of potatoes grown within a radius of 8 miles from Pakenham Station.

Fourteen plots were presented for competition, and these were judged on 3rd and 4th March, 1914. The varieties selected by the growers were:—Carman, Brownell's Pink Eye, Cook's Favorite, Dates, and Scottish Triumph—Carman being in the majority.

The crops were grown in the productive swamp land of the district. This soil is eminently suitable physically for growing potatoes, its freeness being just what is required for the growth of tubers of the finest shape and quality, while the texture of the soil is such as permits the potatoes to leave the ground freely when dug, thus making a bright and attractive sample.

On the average the yield per acre was only moderate, owing to the dryness of the season.

The standard of cultivation on a number of plots was excellent, giving evidence of the fact that the competitors were fully alive to the importance of intertillage during the growing period. The cleanness and neatness of the plots was enhanced by good straight drilling. The crops were judged on the following points:—

Quality 45, embracing the marketable value for culinary purposes, evenness to type and variety.
Yield 35.
Evenness 10.
Cleanness 10.

The maximum number of points for quality and yield was given to crops highest in these and to the others *pro rata*.

The results were as follows:—

Plot No.	Grower.	Variety.	Quality (45).	Yield (35).	Evenness (10).	Cleanness (10).	Total (100).
1	W. Reid ..	Carman ..	45	35	9	9	98
2	S. B. Stevenson	,, ..	44	34	8	9	95
3	A. Harris ..	,, ..	44	33	7	9	93
4	J. Lear ..	P.E. ..	41	35	9	7	92
5	W. Carnoy ..	Carman ..	42	32	8	9	91
6	Piper and Stevenson	,, ..	42	32	8	9	91
7	H. Worship ..	C. Favorites	40	30	9	9	88
8	W. Johnson ..	Dates and Brownells	40	30	8	8	86
9	*Worship and Stevens*	*Brownells*	35	30	9	9	83
10	J. Ellett ..	Carman ..	30	35	7	8	80
11	J. Wadsley ..	S. Triumph	30	32	7	9	78
12	F. Dawes ..	Carman ..	35	25	6	6	72
13	J. Dawes ..	Withdrawn					
14	J. Gordon ..	,,					

There are two points which I think are well worthy of the consideration of growers, not alone in this district, but generally, that are suggested by the results and appearance of the crops entered for above competition, and these are:—

1. Manuring

That the farmers of each district should endeavour by experiments to prove whether or not it would be advantageous to use other manures in conjunction with phosphate with the view of profitably increasing the yield per acre. In the Pakenham district growers are relying almost entirely on superphosphate at rates varying from 2 to 5 cwt. per acre, and I am of the opinion that the application of say 1 cwt. of sulphate of potash with the super. would be found profitable. Peas or peas and rye, either fed off or ploughed in as green manure would be of great value in maintaining the fertility and physical condition of the soil, and in a season such as the present, the direct effect of the increased quantity of moisture retained by the soil due to green manuring would be markedly shown in the heavier crops resulting.

2. Evenness.

The evenness of crops can practically be guaranteed if a proper method of seed selection be practised. Where conditions of soil and manuring are uniform over a field, any unevenness of the crop must be due to mixed seed or to the seed being unequally sprouted at the time of planting. Seed should be properly treated in order to guarantee uniformity throughout the crop.

A description of the best means of seed selection and treatment appeared in the *Journal of Agriculture* for February, 1914.

A BULLA FARM.

By J. S. McFadzean, Senior Dairy Supervisor.

The growing of lucerne is usually considered as concomitant with naturally rich soil; so much so that, in the absence of suitable alluvial land, most people will not attempt to grow this fodder. The fact, however, is that lucerne will grow on almost any land except such as is badly drained; and, once established, it will live through very dry periods; but if repeated cuttings are expected from it during the warmer months, a regular supply of water is then necessary in its cultivation; with this provision, it is in the warmer and drier districts that it flourishes most luxuriantly. That comparatively poor land is capable of being made to grow prolific crops of lucerne has, in the Bulla district, been demonstrated in a very thorough manner by Dr. G. D. Dickinson, of Moonee Ponds. His farm, "Sherwood," is a 320-acre block situated on the north side of the Green Vale road, about 1½ miles from Oaklands Junction, and 14½ miles from the Melbourne General Post Office. The soil thereon is a sandy loam of some 8 to 10 inches in depth, overlying a cement-like layer of about 4 to 5 inches, which rests on the clay subsoil. As grazing land this is comparatively poor; the cement layer prevents the roots of the plants from reaching the clay, and, in consequence, the grass dries off quickly with the advent of summer weather.

The rainfall of the district averages about the same as that of Melbourne, perhaps a little lower, and hay-growing is the main line of farming followed; but in the spring many of the farmers also engage in dairying while the grass lasts; and, for a few months, forward cream to the Melbourne butter factories. Very few of these dairy farmers make any attempt to extend their dairying season by growing any maize or similar summer crops; and lucerne is an almost unknown plant in the district; so, with the arrival of the hot weather each year, most of the cows in this locality dry off through want of succulent feed. However, every district usually has some special features to commend it; and in this instance it is the quality of the hay grown there. The crops here are, on the average, comparatively light, but the hay is fine in stalk and generally well headed, and thus ranks as first quality for horse feeding. Being so close to the city, this gives the land a higher value than its productivity would otherwise warrant; for, being within easy carting distance, the growers find ready and direct sale for their hay, owing to the number of owners of racing establishments and other users of this class of produce who are located in the suburbs.

Prior to coming into the possession of its present owner some twelve years ago, "Sherwood" was but an average farm as land in the district goes, and, further, most of it had been impoverished by continuous cropping; so, to the onlooker, it appeared as though Dr. Dickinson had purchased it merely with the prospect of grazing a few horses or sheep. But the new owner proved somewhat of an exception. He certainly at first only used the land for grazing a few stock, but such odd hours as he could spare from his professional work he was then devoting to improving the homestead; and this having been fashioned to suit his

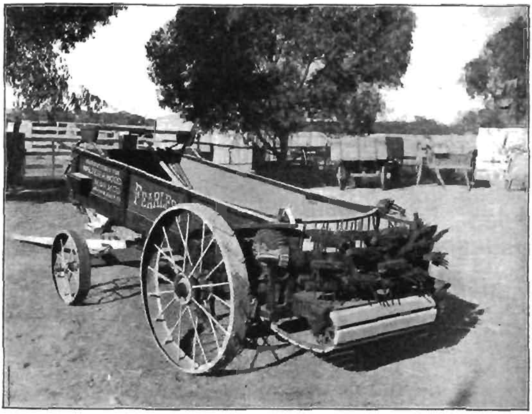
convenience, he then turned his attention to the soil. The farm when purchased possessed one special feature in a fairly permanent water supply, for a deep waterhole on a low-lying site below the dwelling had never failed to supply the requirements of the stock during the driest of seasons. At this a windmill was soon erected, which pumped the water as required to two elevated tanks above the dwelling, having a combined capacity of 3,500 gallons; and with piping from this, the lawns and gardens of the homestead were brought to a condition which assisted to make the farm very attractive as a week-end and holiday resort for the owner's family and friends. These latter, it might be mentioned, would appear to have been particularly well-chosen, for at all times they have heartily co-operated in the carrying out of the many agricultural experiments formulated by their host.

View of Dam.

The contour of the land in this locality is undulating; and on this farm there is a fall towards the middle from both east and west sides, as well as from the further or north end towards the south, at the Green Vale road. This throws all surplus surface water from the land to that lowest part which is immediately below the homestead, where it passes by a culvert underneath the road to find its way eventually to the Moonee Ponds Creek. The question of additional water storage on the farm for purposes of irrigation had been under discussion for some little time, when, in the early part of 1908, Dr. Dickinson happened to be on the farm as a thunderstorm and heavy fall of rain occurred. The resulting volume of water rushing down through and away off his farm so impressed him with its potentialities from an agricultural stand-

towards

conserving at least some portion of this waste water in future. Having consulted with Mr. Daniels, shire engineer at Bulla, on the matter, under his advice a commencement was soon made with the construction of the present reservoir on a site some 600 yards back from the road, commanding an irrigable area of over 80 acres. This scheme allowed for a water storage of 5,000,000 gallons by means of a bank 12 feet high and 5 chains long raised across a small valley, the ends of the bank being carried back to the land slope some 50 yards further on each side at an angle of 45 degrees, and giving a water level 37 feet above the land at the bottom of the farm. This dam was completed to this stage in 1911, and during last year the embankment was raised another 5 feet higher, almost doubling its holding capacity, and giving a water sur-



Manure Spreader.

face of about 4 acres. The water face of the main bank is concreted to a depth of 20 feet on the batter to prevent erosion by wave action. It is intended during the coming year to further heighten the bank by 6 feet, which will give an estimated two years' water storage for all the land it is intended to irrigate. So far piping has been laid to cover about 20 acres. From the stop-cock at the dam there is first a chain length of 6-in. piping, then 2 chains of 4-in., and 45 chains of 3-in; and from this latter is laid some 20 chains' length of movable 2-in. and 1½-in. piping, to which the sprinklers are attached for watering each 40-ft. section.

Experiments in top-dressing pasture had already demonstrated the value of farmyard manure in renovating this land; and, having made

certain that there was a possibility of obtaining a water supply sufficient to allow of irrigation, Dr. Dickinson then set about preparing the land for lucerne growing. Subsoiling, combined with the application of farm manure, he rightly judged would accomplish this. The subsoiling was done by double ploughing, the mouldboard being removed when breaking up the cement pan below the surface soil. The land was then given a good dressing of refuse tannery lime; and later, the manure was spread over the land and thoroughly worked in by cross-ploughing. More than ordinary care was taken to obtain a good compost for this manure dressing, horse and sheep manure being mixed with damaged straw, and heaped together till well rotted down; and the results have been so satisfactory that a "Fearless" manure spreader has now been imported (through Mitchell and Company, the well-known implement makers, of Footscray) from America to facilitate this work in future.

Cutting Lucerne.

This is only the second machine of this pattern that has yet reached this State, and Dr. Dickinson is very satisfied with his purchase.

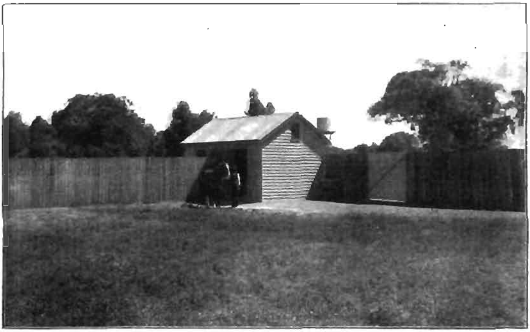
The farm is subdivided into twenty-three paddocks of various sizes; twelve of these are under 10 acres each, three are of 15 acres, four up to 40 acres, and the others larger. When first grown, the lucerne was made use of to top off sheep which were grazed on the other paddocks, and some very good returns were obtained therefrom; as many as 100 head being repeatedly topped up on 2 or 3 acres of lucerne. In one instance ewes purchased as stores returned over six times the price paid for them within nine months through their wool, their lambs, and their re-sale as fat sheep.

Latterly, however, another line of stock grazing has resulted from

tive still.

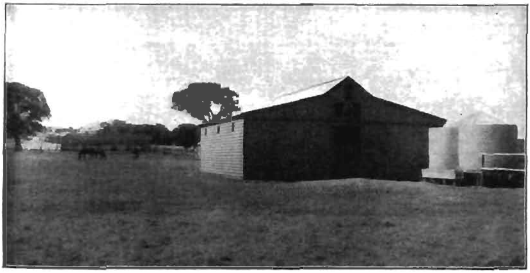
odder for

brood mares or other horses out of active work; and some prominent racing men, having observed the conditions at Sherwood Farm, have decided that it is suited to their requirements; and buildings have been erected to meet their further convenience. So far five half-acre pad-



Stallion Box and Yard.

docks have been arranged on old lucerne ground, surrounded by a close hardwood fencing 6 ft. 10 in. high, and furnished with substantial loose-boxes 12 feet square; and several more of these are now in course of



Loose Boxes.

erection. There is also a lofty stabling of comfortable loose-boxes, specially designed with double roof for coolness and ventilation, with exercise paddocks adjoining, which is also in full use. At this stabling,

as well as at the other farm buildings, large tanks have been provided for rain water catchment in addition to the piped supply from the reservoir, giving 8,000 gallons storage.

Through the combined dry cultivation and irrigated lucerne crops, the farm is self-contained in regard to catering for the requirements of the horses now agisted, and is capable of much expansion on these lines; but Dr. Dickinson has always had a leaning towards sheep farming, and is now arranging to take up the breeding of Corriedales, for which work this country is well adapted.

Though the local farmers are somewhat inclined to look upon "Sherwood" as a farm run as a hobby, there have been, and are still being, carried out there many (to them) innovations in fodder cultivation, which it would be worth their while to take note of. When throughout the exceptionally prolific season for grass that this State has experienced, we find the wholesale price of bran maintained well over 11d. per bushel, and knowing that lucerne hay is fully as valuable a feed as bran for milk production, it would be a profitable proposition to many dairymen to make provision for a small system of irrigation, which would enable them to have an acre or two under lucerne; for at even this year's price of bran £16 per acre would be a very moderate estimate of the value of such a crop to them. Again, in dairy cow feeding, hay made from either field peas or tares closely approximates lucerne as a milk producer, both of which are autumn-sown crops that do well in almost every district with reasonable treatment; and field peas is another of the crops that have been grown on "Sherwood" with great success. Without any other treatment than subsoiling, and without irrigation, 15 acres of this land sown to field peas produced a crop which one of the neighbours characterized as astounding. Yet, in spite of such an example, almost every dairy farmer in this district either buys bran each year for his cows, or allows them to dry off prematurely for want of it. Again, there are to be seen here at present two 20-acre paddocks of English rye fit for cutting, on land that has only been top dressed with farm manure; a splendid illustration of the economic value of this by-product which is but too often wasted. If only unbiased observation were given by them to the practical work that Dr. Dickinson has done on his farm, there is no doubt that it would prove of no small value to the Bulla dairymen, for on it are many striking object lessons.

FORESTRY AND ITS RELATION TO AGRICULTURE.

By H. Mackay, Conservator of Forests.

Forestry means the preservation and maintenance of the natural tree-growth of a country by wise use. It concerns itself, indeed, with the restocking or replenishment of naked and denuded areas, of lands recklessly stripped by the hand of man or by the devastation of fire; hence it includes the sowing and planting of trees to repair the ravages committed by these agencies. Agriculture, on the other hand, is the utilization and cultivation of the soil in order that it may yield the greatest diversity of products for the service of man and beast. The two sciences are closely related to each other, and forests properly controlled and wisely used always have a beneficial influence on agriculture. It is when man goes against natural laws, and strips the cover of mountain and hill, that he and his fellows suffer most loss in the long run. If you denude the mountain and hill-tops, the local rainfall, and especially the regular distribution of such fall, is quickly affected. First, the tree cover, or high forest, disappears; then the underwood, then the grasses and herbage, then the leaf mould or humus, then the subsoil. Thus the real waste and erosion of the surface of all high lands begin. All the soil which affords plant life the means of germination is swept into the streams and valleys below, leaving the naked rocks exposed to the action of sun and frost. Lower down, the gnawing away or erosion first begins with a small runnel in the grass, then a deeper gutter follows, then a still deeper washaway, and finally deep ravines or gulches score the steep slopes in all directions.

Now let us glance a moment at the functions which forests perform in relation to animal and vegetable life. Forest trees, through the fine pores of their leaves, absorb enormous quantities of air, taking in the carbonic acid gas which, in excess and by itself, is so hurtful to animal life, transmuting partly into carbon and storing up this substance in heat, which gives energy for the growth of the tree. Again, through their wealth of foliage, they give out enormous quantities of oxygen, which is an essential life-giving quality for man and beast, thus producing the healthiest conditions for the life of the animal world. Portion of the carbon which they store up is, we know, of the first importance to us when wood is utilized for producing power such as electric light or traction, or for yielding heat and warmth for domestic purposes. From the point of view of practical utility, they further yield the world's supply of timber for the dwellings of man and his works of construction, and no substitute hitherto obtained from metals or minerals can effectively take the place of what they furnish at the cheapest cost. As regards climatic benefits, they regulate the rainfall, preventing sudden floods, and giving out supplies of water gradually from the enormous sponge of which the surface under their shade is composed in the form of springs and small runnels, which gradually grow into streams of limpid water in the deep recesses of their gorges and valleys. The water that does not lie in the great surface sponges of the forest floor, sinks through the softer layers of rock to the bed-rock below, whence it is given out lower down in the form of new springs and small streams.

In the winter, forests are warmer than the bare, unsheltered plains; in the summer they are cooler, tempering the rays of the fiercest sun, and radiating a refreshing coolness from the moist mould below, and from the exhalations of the masses of foliage above. In dry winters, when the ground in the open is frozen temporarily to a depth of several inches, when shallow drains and pools are ice-bound, the forest stream flows unchecked from the warm shelter of its source. Hence the fountain head for water storage is not on the plain, but on the vast forest plateaus and slopes where tree cover and underwood are thickest, and where moss and humus retain moisture under perpetual shade.

As regards the effects of forests on animal life, we must bear in mind the general law that they moderate and temper summer heat and winter cold. In clearings and open grazing paddocks, cattle, horses and sheep seek the grateful shade of forest trees in summer, and take shelter amid the thickest cover in the harsh windy days of winter and early spring. In the late afternoon of a wild, squally day you will always see cattle grazing towards cover if it is to be found. No rugging or ordinary shed covering is like the shelter afforded by a thick belt of warm pines, with a curve to windward while the horns of the crescent nearly surround the camping places allotted to stock. Under proper tree shelter in the winter season, cattle will keep in better condition, and milch cattle will not only keep in condition but yield a better flow of milk for a longer period. The explanation is simple. They rest better, chewing the cud with greater comfort, and being warm throughout the night the milk yield is preserved. How often on bare slopes, stripped of all cover, in Gippsland have I seen milking cows shivering in the cold dusk of a winter evening vainly striving to get shelter from the driving rain. One of the last things regarded in this country is proper shelter and cover for grazing animals. This neglect is as common a feature in farming in many districts, as the exposure of valuable implements and machinery to all variations of the weather. As regards sheep, it is well known that when grazing on cold, wind-swept plains, if their night camp or folding ground is on the lee side of a warm, natural timber belt, they keep in better condition; while the fleece, as a rule, is finer, with a better staple. In the lambing season in May or June, shelter and warmth are everything to ewes and lambs; and when they are provided the percentage of losses in cold and frost is greatly reduced. Again, in the shearing season, in spring, if a blizzard suddenly occurs, with cold, driving showers and snow, the losses are at times very heavy with newly-shorn sheep in bleak open country where the graziers neglect to provide cover. Over forty years ago one of our largest graziers of the western plain awoke to the fact that good grass is not everything in sheep husbandry. He spent many hundreds of pounds in ordinary wind-breaks, not the best of their kind, composed of such trees as prickly acacia, firs, wattles and gums; and soon found that in the percentage of increase, the general condition of the sheep, and the quality of the wool, he was repaid tenfold.

As regards the protection of young growing crops by wind-breaks or screens, there is often a time in early spring when dry, cold winds prevail and blow for several days at a time. Everything becomes dried up, and backward crops especially suffer greatly. In such a case, the contrast between sheltered and unsheltered land is quickly seen. In land

surrounded by belts of timber evaporation from the soil is lessened, the wind loses its force, and the mild spring sun has a marked effect on the growth. On unsheltered plains the crop soon becomes wilted, and even yellow in patches, while all growth is checked by heavy night frosts.

In the case of orchards, the warm shelter of high hedges, including such plants as Monterey Cypress, and pittosporum, frequently makes the difference between a good fruit crop and partial failure. The orchard being protected from the sweep of heavy winds, both blossom and fruit set better, and as the season advances the percentage of early windfalls is greatly reduced.

SHELTER BELTS.

In laying down shelter belts in open paddocks, it is well usually to choose the sheltered, or lee, side of a hill or slope whenever this is possible. On plains or flat country the thickness of the planting takes the place of the hill shelter. All belts should be carefully fenced when necessary, in order to exclude rabbits and hares. Straight lines should be avoided, and all planting done in curves or semi-circles, the opening for shelter being on the leeward side. Pines and low-growing bushy cypresses should be chosen for hardiness wherever the rainfall is good in the southern districts; while sugar gums, peppers, cypresses of species which will stand great heat, or pittosporums, are best for the northern plain. All eucalypts used for wind-screens should be pinched back as regards their leading shoots in the early stages of growth, so that the habit of the tree will be kept bushy and low.

Now as to shade and coolness around homesteads. Where soil and moisture are good, there is nothing finer for beauty and shade than the English Elm, with the White American Elm and Oriental Plane as its companions. For an even hardier tree, take the robinia, or false acacia, which, like the above three, is deciduous Place leaf-shedding trees, for preference, around a home, as they are bare and allow the sunlight to keep the surface fairly dry in winter, while affording ample shade in summer. If you prefer Australian trees, keep them somewhat further away from the house, on account of their strong root growth affecting garden plots; but take sugar gum, West Australian red gum (or calophylla), eugenias, pittosporums, and silky oaks for shade as well as for beauty. Wattles are short-lived, and must frequently be renewed; but they beautify the landscape in spring-time. For hedges, although many people prefer the Monterey Cypress of California, Victoria has in the dark green Pittosporum of Gippsland one of the finest of hedge plants, with its shining dark green foliage, each spray spread fan-like to the sun; no other plant equals it for this purpose. On sandy soil, the tagosaste makes a quick and effective wind-screen; while on the grey sandstones of Gippsland and Otway the satin box with the silvery underpage of its leaf grows quickly, bears clipping and trimming well, and gives warm cover to homesteads as well as to live stock. On hot, dry areas such as our northern plains, strips of such plants as alfalfa and sunflower are also useful, as they yield a refreshing coolness when the sun is declining. For streams or sheets of water such as tanks and dams, the weeping willow, golden osier, grey and white poplars and sycamores or lindens, are the most suitable for planting.

Every intelligent land-owner can stay his hand from stripping and destroying, as is too often done, nearly every tree of natural growth on

the soil he controls. Further, instead of destroying, he can do his part in building up new forms of tree cover, which improve the soil and beautify the landscape. He can provide for himself a few hundred trees of the hardier species at a price under a penny per plant. He has only to make a seed bed for the seed of open-root plants such as pines and hardy cypress, and plant out cuttings of broad-leaved deciduous trees, in order to make a start with this work. The young plants must, of course, be attended to, and transplanted from time to time, in order that they may have vigorous and healthy roots. The slight care and attention with the watering in summer are well repaid by the number of plants fit for planting over his land which he obtains. At a cost of from £3 to £5 a year, he may steadily improve the appearance of his farm by trees and shelter belts. In beautifying his homestead he must spend a little more, since trees such as elms and planes require greater care in growing, and should not be planted out in their permanent sites until they are from four to seven years old.

A final word as to forest protection, since this is a matter which is neglected throughout Australia. There is a duty which rests with us all, and which goes much deeper than what we usually term politics. This is, to leave the land we live in better than we found it. Not, therefore, to leave its soil exhausted, its rivers and streams shrunken and low, or dried up, and its forests hopelessly denuded, burnt, and in great part destroyed. Yet he must be a shallow observer who does not see the active and insidious forces at work which threaten to bring these disasters upon us in many parts of Australia.

In protecting your forests, you protect your water supply, since they curb and regulate the flow in period of heavy rainfall, retaining immense masses of snow in the higher recesses of mountain valleys, and allowing it to melt slowly, so that in early summer, when water is needed for farm, orchard, and pasture, you have ample supplies at hand. Often as late as December I have at high elevations come on great masses of snow under forest cover, and stored in deep rock clefts of the upper valleys; whilst on fire-swept and denuded table-lands of the same range not a vestige of snow or moisture remained. The exposed snow had long since melted, and had been carried down the steep falls to swell the waters of the Murray and Goulburn in the form of spring floods.

In the vicinity of this very town* where you are assembled, the State has had to spend some thousands of pounds in keeping the waterway open for the navigation of small steamers. Enormous bodies of silt are brought down with each freshet, and a dredge has had to be kept at work for long periods. The root of the evil lies, not in any natural condition, but in the neglect of the first principles of forestry, under which long stretches of the water-shed of the river have been denuded, and the banks stripped of their cover. I am old enough to remember when the Loddon and Wimmera rivers were beautiful clear streams, with deep lagoons at intervals, flowing between banks fringed with red-gum and underwood, with grass and fine herbage to the water's edge. Then followed thirty years of spoliation by man, accompanied by mining and sluicing in the case of the Loddon. The trees were killed on the upper reaches, then

the banks washed away, the lagoons and pools became filled up with sand and gravel, and deep channels and ravines took the place of the shallow grassy bed of the original stream. Now both rivers in summer trickle at the bottom of eroded channels, or slowly find a serpentine course through immense bars of gravel and silt. The old beauty of the deep-shaded pool and lagoon, where cattle and sheep found never-failing supplies of clear water in the driest summer, is gone for ever. I have mentioned these two well-known Victorian streams only, but how many others within your own knowledge are in even worse case.

In a land such as this, liable to drought and irregular rainfall, there is no water storage safer than the shelter of mountain and hill forest. No work of man, in the shape of reservoirs or immense basins and dams, can take the place of these great storehouses of nature. Therefore, it behoves us all, if we wish to see the fertility and general productiveness of this State utilized to the utmost, not merely for the small population which now inhabits it, but for at least ten times that number, to maintain and safeguard these sources of water supply, timber supply, and climatic benefits.

NITRATE OF SODA *V.* INOCULATION.

In view of the discussion on Professor Bottomley's method of treating peat by inoculation, it is interesting to note that Herr E. Ramm, the well-known German agricultural scientist, has an article on a kindred subject in the *Illustrierte Landwirtschaftliche Zeitung*.

Herr Ramm, in discussing the difficulty of inoculating hundreds of acres, explains that on the State farm, in the Wiesmoor, a dressing of sodium nitrate (180 lbs. per acre) was substituted for inoculation.

The attempt has been most successful. The crops grew well right from the start, and developed in a thoroughly satisfactory manner.

From this time, all new crops in the Wiesmoor have been thus prepared the results have been uniformly successful, and no interruptions in the cultivation operations have occurred. In eight to fourteen days after germination the roots of the clovers and other leguminous plants show plenty of nitrogenous nodules. On areas which have not been inoculated or manured with nitrate the root nodules do not make their appearance until much later, generally not until about eight weeks have elapsed.

The practical results of the experiments on the Wiesmoor show that where new crops must be sown throughout the spring and summer a nitrogenous manure is less troublesome and much more certain in its effects than inoculation. Thus, the application of easily soluble nitrogen is preferable from an economic stand-point.

It should be the task of science (says Herr Ramm) to ascertain the source of the bacteria, which, on the application of nitrogenous manure, produce such a general and regular crop of nodules on the roots, and to account for the increased bacterial receptivity possessed by plants with nitrogenous manuring.—"Fertilisers," November, 1913.

Nitrate of soda, in its simple condition, is mainly used on market gardens in Victoria. According to the above experiment, it should act very well on the Koo-wee-rup swamp soils and the peaty soils of reclaimed areas.

FARM SANITATION.

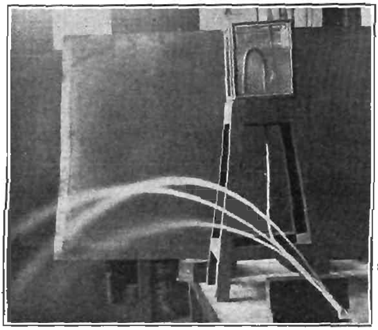
(Continued from page 413 Vol. xi., 1913.)

By C. H. Wright, Instructor in Plumbing, Swinburne Technical College, Hawthorn.

PART 4.—SEPTIC TANKS AND SEWERAGE CONNEXIONS.

Filters.

We have previously dealt with the anaerobic (septic tank) treatment and its results, now we will deal with the aerobic (filter) treatment. This second process of purification is performed by the action of the aerobic bacteria which use the organisms that live only in the presence of atmospheric oxygen. The result of their combined work is the conversion of the sewerage into a clear effluent, which can be discharged without danger of pollution.



MODEL SHOWING LENGTH OF SPRAY FROM 22 INCH HEAD OF WATER.

The discharge from a septic tank should be over what is termed *a filter, in order that* it receives the aerobic treatment.

It must be remembered that in all artificial filters we only imitate the process which nature performs for us in land; but, in the case of land, however, it is only the first few inches which are usefully employed by the aerobic bacteria, whereas, in an artifically constructed filter, the whole of the depth can be employed.

It would be impossible, in a short article of this description, to explain even a few of the various styles of filters and distributors now in use. The one object is rather to direct attention to the value of aeration. The value of a filter depends upon the facilities which the oxygen has of penetrating into the pores of the material. An ordinary filter will contain a certain amount of atmospheric oxygen, and when that is consumed, a period of rest will re-aerate and make it again useful.

Filtering mediums consist of coal clinker, over-burnt brick, coal, or coke.

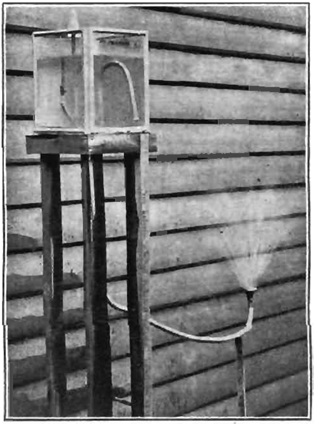
Coal clinker is found to be good; over-burnt brick, after being in use for some months, degrades badly, and so, to a lesser extent, does coal; but if clinker is carefully picked, there will be no degradation

for years. Coke gives excellent results as a filter medium. The numerous cavities and pores presenting a large surface furnish favorable points to which the micro-organisms can become attached, and prevent them being washed away; they also retain air for the purposes of aeration. Every precaution should be taken to keep out sand, clay, and such like substances. A satisfactory depth for an aerobic filter is from 5 to 7 feet.

The size of filtering material should range between 3 inches as a maximum and 2 inches as a minimum.

In some cases a filter with open sides, which allow the air to freely penetrate into the interior, has proved an undoubted success.

An economically-constructed filter, suitable for small work consists of a sloped concrete base, with four posts built into the concrete at the corners, and the whole surrounded with extra strong wire netting, reinforced by stout galvanized-iron wire, 4 or 5 inches apart, to support the filtering mediums. The effluent is discharged upon the top of this structure, and it should take about fifteen minutes to run through the filter. In order that we better understand the merits of this filter, let us briefly reconsider what should take place in the filter.



MODEL SHOWING HEIGHT OF SPRAY FROM 22 INCH HEAD OF WATER.

The oxidation, like the previous decomposition, is the work of micro-organisms, but of a totally different kind from those which operate in the tank.

The latter are of the species classed as anaerobic, living in the absence of air and light. The organisms which work in the filter, on the other hand, are aerobic, the presence of oxygen being absolutely necessary for their life work. Consequently, the conditions prevailing in the tank must be reversed in the filter, to which oxygen *must be freely supplied; to this end the filters are best constructed of* some porous material which affords abundant interstitial space.

It is well known that newly-constructed filters do not at first yield a pure effluent.

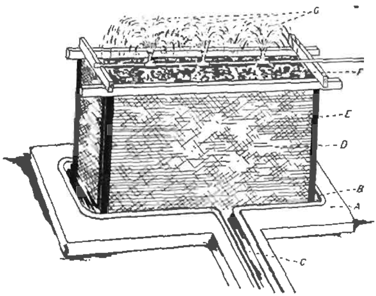
During the first few weeks of operation the purification increases from day to day. Something of the character of a surface film is formed; forms of life soon begin to inhabit the filter.

It must be distinctly understood that the work done is by forms of life.

They are ready and willing to work, but correct results can only be obtained when man performs his part. A period of rest is required for filter beds. If these are kept working too long, oxygen cannot enter, the life dies, and the filter is "worked to death."

This filtration of sewerage or sewerage effluent is not a mere straining action, if it were so the filters would soon clog and become useless; moreover, the effluent from the tank, being free from solids, is not susceptible to improvement by straining.

The walls of the filters may be constructed of concrete, honeycombed with 3-inch stoneware pipes, spaced about 3 inches apart, the outer ends of these pipes are at a higher level than the inner, the slope being to guard against the fluid passing out from the sides of the filter.



FILTER.

A. Concrete base with *B* depression, in which stands filter leading to *C* effluent drain. *D.* Wire netting in *E* wooden frame enclosing *F* coke. *G.* Discharge of sewage.

About 2 feet apart pipes with open joints should run right through the filter from side to side and from end to end, for the promotion of aeration. The spaces between the pipes for the full depth of the filter should then be packed with coke or any other material mentioned.

The air naturally follows the discharge into the filter. *But advantage should be taken to cause the discharge from the tank to drop like rain into the filter bed.*

If a circular form of filter is constructed the distributor could consist of a bucket rotating on ball-bearings and fitted with radial arms of ¾-inch galvanized pipes perforated with holes every 5 inches, these holes should only be made on one side of the pipe, and in opposite directions to one another, the pressure of the water on the sides opposite to the holes forcing the arms to revolve.

There are several makes of sprinklers on the market that will provide a suitable spray.

Too much attention cannot be given to aerating the discharge over the filter, and also of the filter itself.

In this disposal of sewerage by the septic tank system, the laboratory of nature is practically utilized and applied in the most scientific, but at the same time, in the very simplest and cheapest manner possible. The very highest results should be aimed at.

RUTHERGLEN EXPERIMENT FARM.

REPORT ON THE PERMANENT EXPERIMENT FIELD, 1913.

II.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

TOP DRESSING OF NATURAL PASTURES.

The natural pastures of Australia form one of the principal sources of national income, since practically the whole of the sheep and the greater part of the cattle are supported almost exclusively by the grazing of the natural herbage. In this State approximately 5½ million acres are devoted to cultivation and 30 million acres to grazing and pasture. On these areas approximately 12 million sheep and 1½ million cattle are annually grazed.

From these figures it will be apparent that the preservation and improvement of our pastures is one of the most important problems confronting the State. Natural pastures are liable to injury and depreciation either by injudicious grazing, overstocking, and by spread of noxious weeds. By injudicious grazing and overstocking the best types of grasses tend to disappear, and the poorer types of indigenous vegetation are left to hold sway with a horde of naturalized aliens. The alien vegetation is almost invariably less valuable than native grasses that have been supplanted. The spread of such weeds as St. John's Wort, Hoary Cress, and the multitudinous array of proclaimed plants have lowered the grazing capacity of many fine natural pastures, and have even detrimentally affected land values. There are, however, large areas of natural pastures in the State which have a low grazing capacity, not because they have been injudiciously stocked, nor yet because of the uninterrupted spread of worthless weeds and alien plants, but because of the natural poverty of the soil on which these pastures thrive. One of the most reliable guides to the quality of the soil in any given district in the nature and quality of the timber and grass that grow naturally on the area. Rich, succulent, natural pasture of high-fattening capacity is a sure indication of a soil abounding in virgin richness. On the other hand, the growth of dwarfed and sparse indigenous grasses in open belts of country is an equally sure sign of poor quality soil.

Chemical analysis of a large number of soils have demonstrated that Victorian, indeed, Australian, soils are characteristically deficient in phosphoric acid. For this reason such small applications of superphosphate as ½ cwt. per acre applied to the wheat crop produces a most marked effect on the resultant crop. This regular application of superphosphate has now come to be regarded as an essential for successful wheat growing. But there is every reason for believing that similar applications of soluble phosphates to grass lands would produce very marked effects on the stock-carrying capacity of those pasture lands which have never yet been brought under crop, and which are kept entirely for grazing.

Poor pastures may be improved in two ways:—

(1) By breaking up the pastures with the plough and sowing them down either with native or imported grasses of a type superior to those in the existing pasture.

(2) By topdressing the poor pastures with suitable fertilizers and soil amendments.

The former method of improvement is open to several objections. As soon as the land is brought under cultivation the indigenous vegetation tends to disappear, and many of these grasses are well suited to our climatic conditions, and have good fattening qualities. Moreover, this process of renovation is costly, and over the great bulk of our pasture lands difficult of application. The latter method, namely, the improvement of pastures by top-dressing with fertilizers is capable of wide

Fig. 1--Weighing the Lambs on to the Pasture Plots.

application. The improvement in the pasture is based upon the prior improvement in the land itself. By improving the chemical composition and the physical and biological condition of the soil by the application of fertilizers and soil amendments the soil becomes capable of supporting a more vigorous growth of higher quality herbage, and the stock-carrying capacity of the pasture is greatly increased.

The strength of a chain is determined by the strength of the weakest link. The amount of growth is determined by the amount of the most

deficient plant food present in the soil. A superfluity of the majority of essential elements will be of no avail if the supply of any one essential element be below the requirements for vigorous healthy growth. And since the majority of our soils are invariably short in available phosphoric acid, it follows that crop production and growth of grass will depend chiefly on the supplies of soluble phosphate within the body of the soil.

To test the effects of phosphates on grass land, four plots, each ½ acre in area, were marked out on the natural pasture land at the Rutherglen Experiment Farm. Plot 1 was top-dressed with superphosphate, in 1912, at the rate of 1 cwt. per acre, and a similar application was made in the Autumn of 1913; plot 2 was unmanured; plot 3 top-dressed with Thomas' phosphate at the rate of 2 cwt. per acre; and plot 4 top-dressed with 2 cwt. superphosphate and 10 cwt. of lime per acre. The dressings were applied on 14th February, the super. and Thomas' phosphate being put on with an ordinary seed drill, and the lime with a Jack lime distributor.

The effects of the manurial applications were very noticeable to the eye, the herbage on the manured plots being more abundant and of deeper tint than that of the untreated plot, and containing a richer growth of trefoils. This difference was very marked in the early stages of growth, and especially where superphosphate was used. In order to test the grazing and fattening value of the grass, the same number of uniform quality lambs were placed simultaneously on each plot on 14th November. Sixty lambs were used in the feeding-off process, and, of these, twenty were Lincoln x Lincoln-Merino, twenty English Leicester x Lincoln-Merino, and twenty Border Leicester x Lincoln-Merino crossbreds. The members of the respective groups of crossbred lambs were got by the same ram, and the whole of the 60 lambs were obtained from a flock of exceptionally uniform Lincoln-Merino 6-tooth ewes.

Fifteen lambs, comprising five Lincoln x Lincoln-Merino, five Border Leicester x Lincoln-Merino, and five English Leicester x Lincoln-Merino, were placed on each plot, and the sheep weighed on and off the plots. The increases in live weight are set out in Table I.

TABLE I.

INCREASES IN LIVE WEIGHT OF CROSSBRED LAMBS ON GRASS LANDS VARIOUSLY TOP-DRESSED (RUTHERGLEN EXPERIMENT FARM, 1913).

Plot.	Treatment.	Weight On.	Weight Off.	Days on Plot.	Increase of Live Weight per Plot.	Increase of Live Weight per acre.
		lbs.	lbs.		lbs.	lbs.
1	Superphosphate, 1 cwt., 1912; 1 cwt., 1913	960½	1,206	28	245½	491
2	*No Manure*	950	1,069	21	119	238
3	Thomas' Phosphate, 2 cwt., 1913 only	952½	1,146	28	193½	387
4	Superphosphate, 2 cwt., 1913; Lime, 10 cwt., 1913	943½	1,192	28	248½	497

The lambs were removed from the plots as soon as the grass was eaten off. The results confirmed the opinion expressed by farmers on "Farmers' Field Day" that the plots treated with superphosphate and

lime were of higher grazing value than the other plots. It will be noted from the table that the increase of live weight due to the application of superphosphate, and superphosphate and lime, is more than double the increase in live weight of the unmanured plot. The experiment will be continued, for it is very unlikely that the full effect of any of the manures would be felt the first season. Indeed, it was not expected that with slow acting manures, like Thomas' phosphate and lime, the full effect would be exercised forthwith. Moreover, owing to the extremely dry winter of 1913, it is more than probable that the dressings would not be as effective as they might have been in a normal or wet season.

Fig. 2—Crossbred Lambs grazing on Pasture Plots.

A rather interesting point in connexion with the tests with the different breeds of lambs was the differential increases of each breed on the various plots. These increases are set out in Table II.

TABLE II.

Differential Increases in Live Weight with Lambs of Different Breeds.

Name of Crossbred Group.	Increases in Live Weight.				
	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.
Five Border Leicester x Lincoln-Merino ..	76	28½	70½	88	263
Five Lincoln x Lincoln-Merino	76	38½	59½	81	255
Five English Leicester x Lincoln-Merino ..	93½	52	63½	79½	288½
Totals	245½	119	193½	248½	806½

The experiments will be continued and extended during the coming year, and efforts made to determine the exact monetary value of the increases in live weight. It is very desirable, indeed, that exact information should be gained as to the actual increase in weight of the herbage on each plot arising from the differential treatment, that some form of botanical analysis indicating the changes in the character of the herbage from year to year be made, that these differences should be correlated with the grazing value of the pasture, and that the immediate and indirect effects of each dressing should be noted.

PERMANENT FERTILIZER TESTS.

The permanent fertilizer tests comprise a series of 40 quarter-acre plots, of which, in any one year twenty are placed under crop and twent are either fallowed or placed under forage crops. The plots are per-

Fig. 3—View of Plots in Permanent Manurial Field.

manent in character, *i.e.*, the same manurial treatment will be continued on each plot in alternate years. The permanent character of the plots make them *more important than the ordinary fertilizer trials.* Besides testing the direct or immediate effect of various phosphatic, nitrogenous, potassic manures, and lime, singly and in various combinations, these plots will also indicate the indirect or cumulative effect of each manure over a period of years, and the effect of each application on the quality and stock-carrying capacity of the natural herbage. At the present time, the vast majority of Victorian wheat farmers prefer superphosphate to any other form of phosphatic manure. Compared with basic slag and bonedust it invariably gives much higher net profits the first season. There can be no doubt, however, that the indirect effect of these less soluble phosphates would be considerable, and would influence future wheat crops as well as the growth of the grass. For this reason the determination of the cumulative effect of various phosphates is a matter of considerable importance. The plots established at Rutherglen have

been designed to test the merits of the following fertilizers:—Farmyard manure, lime, superphosphate, basic slag, bonedust, nitrate of soda, sulphate of ammonia, and sulphate of potash.

The twenty plots were sown on 8th May with 61 lbs. of graded Federation seed per acre. The plots were harvested on January 5th-6th with a combined harvester, and the standing straw was cut on 12th January to secure the yields of total produce. Table III. summarizes the results of the tests.

TABLE III.

WEIGHT OF TOTAL PRODUCE, ALSO GRAIN AND STRAW, FROM PERMANENT FERTILIZER TESTS.

Plot.	Treatment.	Total Produce per Acre.					Total Straw per Acre.			**Total Grain per Acre.**			Ratio Straw Grain.	Gross Return per Acre. at 3s. 4d. per Bushel.		
		lbs.	t.	c.	q.	lbs.	lbs.	t.	cwt.	**lbs.**	**bus.**	**lbs.**		£	s.	d.
1	Farmyard Manure, 10 tons ..	5,452	2	8	2	20	3,780	1	13¾	**1,672**	**27**	**52**	2·26	4	12	11
2	Farmyard Manure, 10 tons + 10 cwt. Lime	5,116	2	5	2	20	3,420	1	10½	**1,696**	**28**	**16**	2·02	4	14	3
3	Nil	3,150	1	8	0	14	2,038	0	18	**1,112**	**18**	**32**	1·83	3	1	9
4	Super., ½ cwt.	4,832	2	3	0	16	3,120	1	7¾	**1,712**	**28**	**32**	1·82	4	15	1
5	Super., 2 cwt.	5,668	2	10	2	12	3,760	1	13½	**1,908**	**31**	**48**	1·97	5	6	0
6	Super., 1 cwt.	5,580	2	9	3	8	3,720	1	13¼	**1,860**	**31**	**0**	1·95	5	3	4
7	Super., 1 cwt. + Sod. nitrate, ½ cwt. (with seed)	5,292	2	7	1	0	3,600	1	12	**1,692**	**28**	**12**	2·13	4	14	0
8	Super., 1 cwt. + Sod. nitrate, ½ cwt. (spring)	5,408	2	8	1	4	3,500	1	11¼	**1,908**	**31**	**48**	1·83	5	6	0
9	Super., 1 cwt. + Sulph. Am., 44 lbs.	5,328	2	7	2	8	3,540	1	11½	**1,788**	**29**	**48**	1·98	4	19	4
10	Super., 1 cwt. + Sulph. Am., 44 lbs. + Potash, ½ cwt.	5,196	2	6	1	16	3,440	1	10½	**1,756**	**29**	**16**	1·96	4	17	7
11	Nil	3,508	1	11	1	8	2,300	1	0½	**1,208**	**20**	**8**	1·90	3	7	1
12	Bonedust, 1 cwt. (Phos. content = P. 6)	5,628	2	10	1	0	3,940	1	15	**1,688**	**28**	**8**	2·33	4	13	9
13	Thomas' Phosphate, 1 cwt. (Phos. content = P. 6)	5,392	2	8	0	16	3,700	1	13	**1,692**	**28**	**12**	2·19	4	14	0
14	Thomas' Phosphate, ½ cwt. + Super., ½ cwt.	5,568	2	9	2	24	3,840	1	14¼	**1,728**	**28**	**48**	2·22	4	16	0
15	Super., 1 cwt.	5,992	2	13	2	0	4,160	1	17	**1,832**	**30**	**32**	2·27	5	1	9
16	Super., 1 cwt. + Lime, 5 cwt.	5,724	2	11	0	12	4,000	1	15¾	**1,724**	**28**	**44**	2·26	4	15	9
17	Super., 1 cwt. + Lime, 10 cwt.	5,856	2	12	1	4	4,000	1	15¾	**1,856**	**30**	**56**	2·15	5	3	1
18	Super., 1 cwt. + Lime, 20 cwt.	5,932	2	12	3	24	4,120	1	16¾	**1,812**	**30**	**12**	2·27	5	0	8
19	Nil	3,784	1	13	3	4	2,036	0	18¼	**1,148**	**19**	**8**	1·77	3	3	9
20	Super., 1 cwt. + Potash, ½ cwt.	5,720	2	11	0	8	3,840	1	14¼	**1,880**	**31**	**20**	2·05	5	4	5
										Average ..			2·05			

The straw has practically no commercial value in wheat areas remote from the metropolis, or from large centres of population, and is, therefore, not ordinarily taken into account by the farmer in estimating his gross returns per acre. It is still a common practice to burn the stubble each year, even though large losses of organic matter thereby result. We are not here concerned, however, with the merits or demerits of stubble burning, but with the comparative gross or net profit obtained by using the respective fertilizers. The point to bear in mind is that, in estimating the gross returns per acre, we may ignore, in view of existing Victorian conditions, the value of the straw per acre, and consider the returns solely from the point of view of grain yield. Hence Table IV. summarizes the gross returns per acre from each plot calculated from the grain yields, also the gross increases over the returns from the unmanured plot, and the net profit or loss of each manurial application over and above that of the unmanured plot, after deducting the cost of the fertilizer.

TABLE IV.

GRAIN YIELD, GROSS RETURNS, AND NET PROFIT OR LOSS OVER UNMANURED PLOT FROM EACH MANURIAL APPLICATION ON PERMANENT EXPERIMENTAL FIELD.

Plot.	Treatment.	Yield per Acre.	Gross Value of Crop.	*Increase over Unmanured Plot.*	Cash Value of Increase.	Cost of Manure.	**Net Profit per Acre over Unmanured Plot.**
		bus. lbs.	£ s. d.	bus. lbs.	£ s. d.	£ s. d.	£ s. d.
1	Farmyard Manure, 10 tons ..	27 52	4 12 11	8 36	1 8 9	1 5 0	**0 3 8**
2	Farmyard Manure, 10 tons + 10 cwt. Lime	28 16	4 14 3	9 0	1 10 0	2 2 6	**(loss) 0 12 6**
3	Nil	18 32	3 1 9	..	..	..	..
4	Super., ½ cwt.	28 32	4 15 1	9 16	1 10 10	0 2 6	**1 8 4**
5	Super., 2 cwt.	31 48	5 6 0	12 32	2 1 9	0 10 0	**1 11 9**
6	Super., 1 cwt.	31 0	5 3 4	11 44	1 19 1	0 5 0	**1 14 1**
7	Super., 1 cwt. + Sod. nitrate, ½ cwt. (with seed)	28 12	4 14 0	8 56	1 9 9	0 12 0	**0 17 9**
8	Super., 1 cwt. + Sod. nitrate, ½ cwt. (spring)	31 48	5 6 0	12 32	2 1 9	0 12 0	**1 9 8**
9	Super., 1 cwt. + Sulph. Am., 44 lbs.	29 48	4 19 4	10 32	1 15 1	0 13 0	**1 2 1**
10	Super., 1 cwt. + Sulph. Am., *44 lbs. + Potash, ½ cwt.*	29 16	4 17 7	10 0	1 13 4	1 0 4	**0 13**
11	Nil	20 8	3 7 1	..	..	..	.
12	Bonedust, 1 cwt. (Phos. content = P. 6)	28 8	4 13 9	8 52	1 9 6	0 6 3	**1 3 3**
13	*Thomas' Phosphate, 1 cwt.* ..	*28 12*	*4 14 0*	*8 56*	*1 0 9*	*0 4 6*	**1 5 3**
14	Thomas' Phosphate, ½ cwt. + Super., ½ cwt.	28 48	4 16 0	9 32	1 11 9	0 4 9	**1 7 0**
15	Super., 1 cwt.	30 32	5 1 9	11 16	1 17 6	0 5 0	**1 12 6**
16	*Super., 1 cwt. + Lime, 5 cwt.* ..	*28 44*	*4 15 0*	*9 28*	*1 11 6*	*0 13 9*	**0 17 9**
17	Super., 1 cwt. + Lime, 10 cwt.	30 56	5 3 1	11 40	1 18 10	1 2 6	**0 16 4**
18	Super., 1 cwt. + Lime, 20 cwt.	30 12	5 0 8	10 56	1 16 5	2 0 0	**(loss) 0 3 7**
19	Nil	19 8	3 3 9	..	..	..	..
20	Super., 1 cwt. + Potash, ½ cwt.	31 20	5 4 5	12 4	2 0 2	0 12 4	**1 7 10**

The fertilizers have been reckoned at the following costs—Stable manure, 2s. 6d. per ton; lime, 35s. per ton on the farm; superphosphate, 5s. per cwt.; basic slag, 4s. 6d. per cwt.; nitrate of soda, 14s. per cwt.; *sulphate of ammonia, 16s. per cwt.; and sulphate of potash,* 14s. 8d. per cwt.

The stable manure was spread on 2nd April, the lime on 4th April.

A perusal of the tables affords much interesting information—

(1). *Heavy v. Light Dressings of Superphosphate.*

The three unmanured check plots gave returns of 18 bushels 32 lbs., 20 bushels 8 lbs., and 19 bushels 8 lbs., or an average of 19 bushels 16 lbs. Comparing the superphosphate plots with these we have the following results:—

TABLE V.

HEAVY AND LIGHT DRESSINGS OF SUPERPHOSPHATE COMPARED.

Plot.	Treatment.	Yield.	Increase over Unmanured Plot.	Value of Increase.	Net Profit per acre over Unmanured Plot.
		bus. lbs.	bus. lbs.	£ s. d.	£ s. d.
3, 11, and 19	No Manure ..	19 16	..	..	..
4	Super., ½ cwt. ..	28 32	9 16	1 10 9	1 8 4
6	Super., 1 cwt. ..	31 0	11 44	1 19 3	1 14 1
5	Super., 2 cwt. ..	31 48	12 32	2 1 6	1 11 9

From these figures it would appear that heavier applications of superphosphate than are customary in the wheat area could be used with advantage. The average amount of superphosphate used in the wheat areas approximates 56-60 lbs. per acre. The table shows that there is a steady increase in yield, as the amount of superphosphate increases from ½ cwt. to 2 cwt. The highest gross return was obtained from the 2 cwt. plot, but the highest net return was secured from the plot dressed with 1 cwt. superphosphate per acre.

The results are the more interesting from the reason that, owing to the dry winter, the fullest advantage of the heavier dressings could not be taken by the crop. Similar confirmatory results were obtained from Longerenong and Wyuna, where plots treated with no manure, ½ cwt.

Fig. 4—Crop Rotations; Wheat after Rye and Vetches.

of superphosphate and 1 cwt. superphosphate respectively were sown. The results are indicated in Table VI.

In all cases the heavy dressing of 1 cwt. gave greater crop increases than the light dressing, and yielded higher net returns per acre after deducting the cost of the manure. As already indicated the results are of special interest, inasmuch as the average amount of superphosphate used in the wheat areas of the State does not exceed 56-60 lbs. Of course, the returns are for one season only, and, therefore, further confirmation in future seasons is desirable before conclusions can be definitely drawn. It may be remarked, however, that if future experience confirms the present results, a new avenue will be opened by increasing the profits in wheat farming. Whilst on the subject of heavy and light applications of superphosphate it may be remarked that the heavier

dressings might be expected to have a greater indirect effect by the stimulation of the grass in the year of pasture than the light applications. Finally, it may be remarked, that, even if the net profit from heavy dressings were exactly equal to that from light applications, the heavier dressing would be justified because the farmer would be enriching his land with phosphate without extra cost.

TABLE VI.

Showing Comparative Yields and Net Profit from Light and Heavy Dressings of Superphosphate, 1913.

Treatment.	Yields per acre.						Net Profit per Acre over Unmanured Plots.								
	Rutherglen.		Longerenong.		Wyuna.		Rutherglen.			Longerenong.			Wyuna.		
	bus.	lbs.	bus.	lbs.	bus.	lbs.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Nil	19	16	17	22	10	35		..			..			..	
Super., ½ cwt. ..	28	32	25	40	16	43	1	8	4	1	4	8	0	18	6
Super., 1 cwt. ..	31	0	29	31	18	34	1	14	1	1	15	9	1	1	8

Rainfall—From Seed to Harvest—Rutherglen, 10·35 inches; Longerenong, 11·18 inches; Wyuna, 8·73 inches.

(2). *Relative Value of Water Soluble, Citrate Soluble, and Insoluble Phosphates.*

Table III. is also of interest in view of the information it gives on the value of various phosphates for wheat. Plots 6, 12, 13, and 14 received the same amount of phosphoric acid in the following forms:—

(*a*) Water soluble phosphate. (Super.)
(*b*) Insoluble phosphate. (Bonedust.)
(*c*) Citrate soluble phosphate. (Basic slag.)
(*d*) Water soluble and citrate soluble phosphate in equal portions. (Super. and basic slag.)

The net profit per acre after deducting the cost of the manure in each of these four forms was—

(*a*) £1 14s. 1d. (*c*) £1 5s. 3d.
(*b*) £1 3s. 3d. (*d*) £1 7s. 0d.

Here again, it will be interesting to compare the residual effect of these various applications when next the plots come under crop. Taking the figures as they stand, however, a given quantity of phosphoric acid applied in the form of water soluble phosphate (super.) is most effective, and gives by far the highest net profit per acre. A mixture of water soluble and citrate soluble phosphate comes next in value, though 1 cwt. of the mixture is little better (*e.g.*, Plot 4) in effect than half a cwt. of super. by itself, whilst the net profit of the latter is certainly greater. Next in order of merit comes citrate soluble phosphate, and least effective

of all, so far as immediate results are concerned, is bonedust. The bonedust, it must be remembered, contains organic nitrogen as well as insoluble phosphate, and its effect on the crops is partly due to its nitrogen content as well as to the phosphate it contains.

(3). *Lime and Stable Manure.*

The results from the application of lime are somewhat peculiar. From the chemical composition of the soil and the general character of the herbage before the permanent experiments were laid down one would expect that the effect of the lime would be fairly well marked. This was not the case during the season under review.

A comparison of the yields of Plots 16, 17 and 18, which received super., together with varying quantities of lime, and that of Plot 5 treated with super. alone, show that, in all cases, the lime failed to effect any increase in the yield. The net profit from the limed plots was

Fig. 5 Harvesting Rotation Plots.

far less than that of the control plot. Somewhat similar results may be seen by comparing the Plots 1 and 2. Farmyard manure alone gave an increase of 8 bushels 36 lbs., whilst 10 cwt. of lime, in addition to the farmyard manure, gave an increase of 9 bushels over the unmanured plot. The net profit over the unmanured plot from Plot 1 was 3s. 8d. per acre, whilst in Plot 2 the loss was 12s. 6d. per acre.

The season, no doubt, influenced the returns. The winter was abnormally dry for the district, and lime could hardly be expected to show much increase. On the other hand, the duplicate set of plots which were in crop during 1912 gave increases in yield but not increases in net profits with the application of lime. The season 1912 was entirely different from that through which we have just passed. From January to the middle of June practically no rain fell. The following winter was abnormally wet, and dressings of lime might therefore be expected

to show some result. The results were as follow, the variety of wheat sown was Zealand Blue:—

TABLE VII.

RESULTS OF LIMED PLOTS, SEASON 1912.

Plot.	Treatment.	Yield.	Increase over Unmanured Plot.	Value of Increased Yield.	Cost of Manure.	Profit or Loss per Acre.
		bushels.	bushels	£ s. d.	£ s. d.	£ s. d.
15	Super., 1 cwt. ..	16·2	4·8	0 16 0	0 5 0	0 11 0
16	Super., 1 cwt. + Lime, 5 cwt.	17·4	6·0	1 0 0	0 13 9	0 6 3
17	Super., 1 cwt. + Lime, 10 cwt.	18·3	6·9	1 3 0	1 2 6	0 0 6
18..	Super., 1 cwt. + Lime, 20 cwt.	20·2	8·8	1 9 4	2 0 0	0 10 8 (loss)
19	No Manure ..	11·4	..	..	..	..

It must not be expected that the full effect of a manure, or rather a soil amendment like lime, would be observable during the first year. It is reasonable to suppose that the dressings would continue to influence the crop for a number of years, and, therefore, the whole of the cost should not be charged against the crop the first year. Similar observations may be made with regard to stable manure, the effect of which is lasting. Both the stable-manured plots, and the limed plots, might be expected in future years to show considerable changes in the mechanical condition of the soil.

(4). *Other Manures.*

So far as other manures are concerned, there seems to be very little demand by the crop for potash, and for ammonium salts. Nitrate of soda applied with the seed gave no increase. Indeed, the application with the seed of nitrate of soda, sulphate of ammonia, and sulphate of potash, seems to have depressed the yields. On the other hand, a small dressing of nitrate of soda in the spring gave the maximum per acre of the plots, but not the greatest profit. Nitrification is very active in the Rutherglen soil, in spite of its poverty in lime and its shortage of humus. In a carefully prepared bare fallow the amount of nitrate formed by bacterial activity is at a maximum in autumn. Applications of nitrate with the seed cannot therefore be expected to give good returns on fallow land. As the crop grows, the nitrate gradually disappears. A large portion is used by the growing crop, some is washed from the soil by heavy rains, whilst some is lost by the process of denitrification which is always going on in our soils. Under these circumstances nitrates may actually be wanting in the soil by spring time, and timely dressings in August or September will often meet with generous response on the part of the crop. Such dressings are likely to be of most value, however, when the soil is poorly provided with humus, when fallowing is not regularly practised, and when the winter has proved cold and wet, for, under these circumstances, there never can be a superabundance of nitrates in the soil.

(To be continued).

SPECIFICATION FOR BUILDING A CHEAP TOBACCO SHED.

By Temple A. J. Smith, Tobacco Expert.

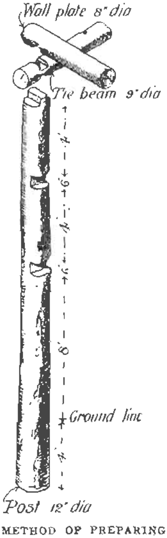
The whole shed can be built of bush timber and material, with the exception of bolts and nails.

A room 16 feet x 16 feet, and 16 feet high, will hold ¾ of a ton of cured leaf, or an acre of heavy tobacco crop. The ideal site for a tobacco shed is on a dry rise—not too exposed to winds. A dry earthen floor is best.

The shed should be built with the length running *north and south. The most suitable timber for building purposes is redgum, stringybark, or messmate.* Box is also good, but difficult to obtain straight and in sufficient length.

Posts should be put in the ground not less than 4 feet, and heavy posts 12 inches or more in diameter at the butts are necessary. The first floor on which the tobacco is hung should be at least 8 feet from the ground floor, and the distance between the first, second, and third floors should be at least 4 feet in the clear. The roof should have a good pitch, as a flat roof is liable to sweat if made of iron, or leak if made of wood, or thatch. A fair quantity of tobacco can be hung in the roof for curing, if it is sufficiently high. *Sheds can, of course, be built of varying sizes to suit the size of available timber.*

Round poles, when obtainable, cut in the form of saplings, can be made to do for practically the whole building. All such timber should have the bark removed, and, if possible, should be cut three to six months before building, as there will be less shrinkage, and it will be lighter to handle. It is also advisable to cut the poles with a little extra length when possible.



METHOD OF PREPARING POST TIE BEAMS AND WALL PLATE.

Timber Required for a Shed.

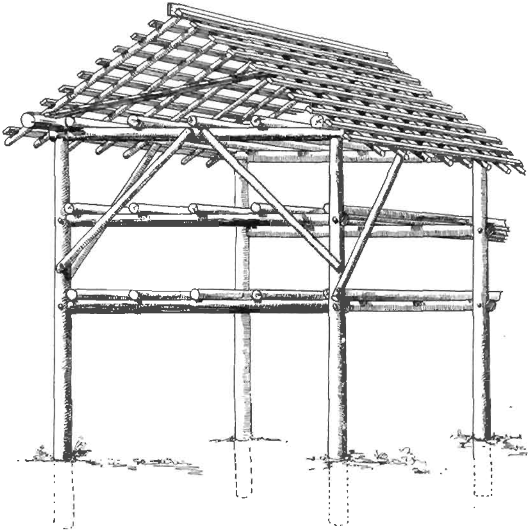
Two rooms long, with skillion on each side each room being 16 feet square, with the skillions each 32 feet x 12 feet.

The main building will require—

- 6 Posts, 21 feet long, 12 inches diameter at butts.
- 9 Tie beams, 16 feet long, 9 inches diameter at butts.
- 4 Wall plates, 16 feet long, 8 inches diameter at butts.
- 30 Stringers, 17 feet long, 6 inches diameter at butts.
- 54 Rafters, 14 feet long, 4 inches diameter.
- 1 Ridge pole, 34 feet long, 6-in. x 1-in. hardwood.
- 40 Battens, 16 feet long, for thatch; or
- 20 Battens, 16 feet long, for iron.
- 4 Braces for roof, each 16 feet long.
- 8 Braces for building, each 12 feet long.

For skillion on each side—

6 Posts, 16 feet long, 12 inches diameter at butts.
4 Wall plates, 16 feet long, 9 inches diameter.
12 Tie beams, 12 feet long, 9 inches diameter.
12 Stringers, 17 feet long, 6 inches diameter.
15 Rafters, 15 feet long, 4 inches diameter.
64 Battens, 16 feet long.
4 Braces, 12 feet long.



SHOWING METHOD OF BRACING SHED AND PUTTING ON STRINGERS.

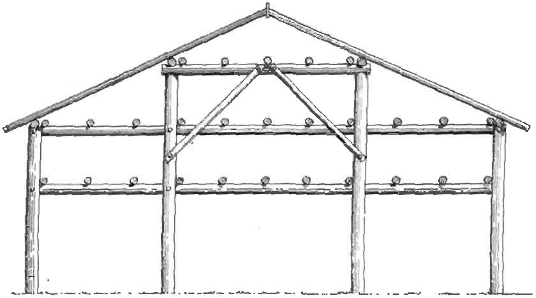
Skillions can also be added to the ends if required.

The cross beams to carry the stringers should be bolted on with ⅝-in. bolts. The sides and ends may be iron, palings, weatherboards, or thatch.

The shed should have plenty of ventilators at the top to allow the escape of moisture-laden air, and doors or shutters should be arranged at each end and round the bottom of the side walls, so that currents of air can be made to carry moisture off; or if necessary to make the curing process slower, the shed can be kept closed, and when fires are necessary the heat can be evenly distributed.

Some of the best sheds are made of wood entirely, Gippsland palings making good roofs and sides. Thatch roofs are good, and sides can be also made of straw or maize stalks, but these are dangerous in being more liable to fire. Iron sheds are useful, but are subject to sudden changes of heat and cold. Iron roofs must have plenty of pitch or be lined with hessian to prevent dripping of water in frosty weather.

The iron shed is the most durable, and, at the same time, more expensive than the others mentioned. Hessian sides 6 feet in depth are often used from the wall plate, the lower wall being iron, wood, or some other material. The hessian can be easily raised or lowered for ventilation purposes, but is not as good as shutters, and in the end is more expensive, as it is seldom of use after the first year.

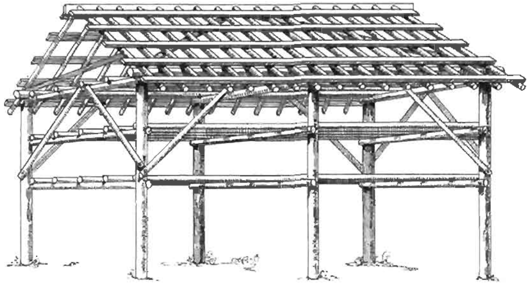


SHOWING END VIEW OF SHED WITH SKILLIONS.

The most economical sheds are those in which the main building contains three to four tiers, or floors of tobacco, with the skillion on each side and end. These strengthen the whole building, and economize wall space. Sheds built on this principle last longer and are easily constructed. The posts should be scarfed for the cross-beams 6 inches wide and 3 inches deep, and the top squared on two sides at right angles to the scarves, so that the tie beam can fit over the top, projecting 3 inches on each side. The scarves for cross beams are best made on the inside of the posts. The first scarf should be 8 feet from the ground, the second 4 feet above the first one, and the tie beam makes the third, 4 feet above the second. The tie beams should be let down on to the posts, say, 2 inches, this practice preventing the shed from spreading with the weight of the roof. The cross beams should be bolted on to the posts.

The wall plates are let into the tie beams an inch, and spiked through into the top of the post, the object being to get the greatest height possible for the skillion roof, and also tobacco space. The rafters should be put on 2 feet apart, keeping the butt ends to the ridge pole. The lower ends of the rafters can project over the wall plate, to

which they should be nailed firmly. The rafters for the skillion roof being lodged beside those on the main roof, on the wall plate, or, if greater pitch is desired for the skillion roof, a heavy batten can be nailed on the main rafters a foot above the wall plate; but in such case longer rafters for the skillion will be necessary to reach from this batten to the lower wall plate. The ridge pole may be either a hardwood board 6 inches x 1 inch, or batten adzed flat on both sides, to which the rafter is footed on. The ridge pole should project a foot beyond the end walls of the building to allow of an eave, as also should the battens. The distance at which battens should be put in depends on the kind of roof to be used. If you thatch, they should be not more than 9 inches between. If for shingles, 6 inches to 9 inches; for Gippsland palings 2 feet; and for iron 3 feet.



SHOWING TWO-ROOMED SHED WITHOUT SKILLION.

The roof should be well braced in each room with battens running from the ends of the wall plates to the centre of the ridge pole, underneath the roof. Both battens and braces should be adzed flat on each side, to leave an even surface on the roof. Thatch roofs can be made of rye straw, rushes, or wheat straw, the first-mentioned being best, and to make a good roof should be at least 4 inches thick. It can be sewn on, working from left to right, and beginning with the lowest batten, the twine binding the straw about two-thirds of the way up the length. The butts of the straw being uppermost, and each succeeding layer of straw should lap the preceding one at least two-thirds of its length. All the straw or rushes used should be kept straight and lie close together. Another and quicker system of putting on thatch, though not as good, is by using whipsticks, which are tied to the battens and the straw placed underneath, the stick being tied down every foot with twine, green hide, flax, or stringybark.

The quantity of wood to which the sides of the shed are made fast will depend on the material used for this purpose, iron sides requiring the least, and wooden sides most. As, for instance, weatherboard sides will require 2-in. x 3-in. studs every 2 feet apart, with ground plates,

braces, &c. Pits for fires when necessary can be simply dug in the floor 6 feet long x 2 feet wide, and 2 feet in depth. These should be placed at intervals over the floor of the shed, so that the heat from the fires may be evenly distributed.

The cost of a tobacco shed will depend upon the command of bush material; but a useful shed, with a capacity of holding 4 acres of tobacco should be from £40 upwards, according to circumstances.

TREE DESTRUCTION WITH ACIDS.

THE following letter addressed to the Editor by C. J. Sketchley, of Waterfall Farm, Glendale, Mazoe, South Africa, is reprinted from the *Rhodesia Agricultural Journal.* The destruction of trees by acid as described, if effectual, would go a long way to solving a problem which confronts the Victorian settler on virgin lands. The letter is as follows:—

"*Re* tree destruction with acids. I have seen many hundreds of acres of bush—large and scrub—completely destroyed with ordinary commercial saltpetre; but the trees were not cut down, as this entails much labour. A hole is bored in the tree in a downward direction to the centre. For large trees a 1-in. auger is used; for smaller ones, ½-in. size is large enough. For large trees, one to two ounces is the quantity used, and for smaller ones half to one ounce. A plug is put in the hole to keep rain from washing it out. The nitrate of potash is carried by the sap to the tips of the branches and to the rootlets. If the tree is a large one, say, 2 feet or more in diameter, very little difference will be noticed in the foliage for two or three months, then the leaves begin to fall, and it assumes a bare, wintry appearance. At the end of about six or eight months you pile a little brushwood round the tree and light it, and there is no further trouble. It will smoulder away to the remote ends of the roots, sometimes 30 feet from the butt of the tree, leaving masses of valuable ash in all directions; while if your bungalow is near to the clearing, you will hear a crash, which will sometimes startle you at night time, when the big trees fall, and when fallen they will continue to smoulder until every particle is converted into ash. The ploughs are then started, and with the ash and burned soil combined, you have a very rich piece of planting land. This is a common method of clearing tobacco land in tropical countries. The price of saltpetre should not be a hindrance to its use, as it is a cheap commodity in most countries."

It is not thought that the treatment shown above will prove effective on the heavily timbered areas of this State, but in the ligher scrub lands it might be deemed worthy of a trial.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART XIII.—CO-OPERATION IN THE DISTRIBUTION AND MARKETING OF FRUITS.

(Continued from Page 175).

By E. Meeking, Senior Fruit Inspector.

Co-operation is no Utopian idea. In many countries and in many walks of life its principles have been put into successful practical operation. In fact, it may be said these principles are the foundation stones upon which the whole fabric of government in civilized countries rests. It is one of the methods by which the tendency to organize is expressed amongst different classes of modern society. This tendency may, indeed, be considered the dominant note of present day civilization. Generally speaking, the results of these efforts have, so far, been beneficial, but when the contending parties awaken to a full realization of the power which each may command by completing their organizations, it is to be feared that their efforts may not be directed towards benefiting civilized society as a whole. Indeed, so apparent has this become with regard to certain organizations that, in some countries, legislative measures to regulate the operations of the parties, have been considered necessary. The class which exists between the two extremes, capital and labour, and which has been termed the middle class, cannot, by reason of the diversity of occupation and interests amongst its members, organize with the same facility as the capitalist and labouring classes. The possibility therefore looms large that the middle class may ultimately be crushed between the two opposing forces. Included in this so-called middle class is the section represented by the major portion of our farmers and other primary producers. At present this section in most civilized countries is being forced into the uncomfortable position of facing as unorganized units the organized parties of capital and labour upon both of whom it at present depends directly for a livelihood.

Combines of Capital and Labour Unions: Their Possible Effect on the Producer.

If, by combination, the capitalist class, which in this case represents those who control the transport, distribution and manufacture of the producer's goods, elects to raise the charges coming under its control, and the labouring class on the other hand, by means of trades organizations, and assisted also in many instances by legislative enactment, elects to raise the price at which it sells its labour, in the work of assisting the farmer to produce, or in handling his produce, the producer, sooner or later, will find himself in the jaws of a vyce with the opposing forces unconsciously acting together in "putting on the screw." Under such conditions, the producing section of the community will be in the most unenviable position of any section, as the producer is, in many instances at once an employer of labour and a labourer. He is, to a certain extent, both a capitalist and a working man, and, at the same time, derives none of the benefits enjoyed by the exclusive members of either class. He has little or no redress unless he, too, unites in safeguarding the common

interests of the section to which he belongs. It is not meant by this that the prime object of such unity should be to further the interests of the producer no matter at what cost to the other sections of the community. The principal aim should be protection, not aggression, except when aggression is necessary as a means of self defence.

SUCCESSIVE STAGES IN THE EVOLUTION OF ORGANIZED CAPITAL.

The formation of the partnership system, then the joint stock company method, and lastly the modern trust or combine principle whereunder huge aggregations of capital control vast interests, may briefly be described as the successive steps by which capital has organized to conserve its interests. These trusts or combines are bound by rigid rules, as well as unity of purpose, to maintain the common interests of members. The chief aim of such organizations is to eliminate competition and to obtain a monopoly of any particular trade or business to which their operations are applied. Organizations on these lines are on the increase in most civilized countries.

OBJECTIONAL FEATURES OF COMBINES.

The chief objection from a national standpoint to organizations founded on the modern trust or combine principle is that the benefits which accrue may be conserved amongst members to the detriment of the community as a whole.

The power of some of these organizations has, in some countries become so great, and competition in certain lines of industry has been so completely destroyed, that much restraint of trade has resulted. These combinations have been made possible mainly through improved methods of production and manufacture, brought about by the invention of labour-saving machinery, and other causes. Improved methods of transport and communication have also widened the sphere of the producer and manufacturer and brought an ever increasing market within reach.

DEARTH OF ORGANIZATION AMONGST PRODUCERS.

Combinations on the lines indicated have not so far, been undertaken by those interested in the raising of primary products, but have been *exploited solely by those who control the secondary industries which* are comprised in the manufacture of primary products and in the distribution (buying, selling, and transportation) of same. The methods of combinations which have proved so successful in conserving the interests of those who are engaged in the secondary industries are not easy to carry into effect, so far as the primary producer is concerned.

REASONS FOR WANT OF UNITY AMONGST PRODUCERS.

The isolated mode of *living followed* by the ordinary farmer, and his reliance on individual effort engender in him a spirit of conservatism which militates against his ready assimilation of modern business methods. He is, therefore, as an individual, to a great extent at the mercy of organizations which sell his products and supply him with the necessary material in connexion with same. Everything he purchases in the way of machinery or other accessories essential for carrying *on his calling is obtained from* those who have, through long

experience, become specialists in these matters, and who may on this account charge him a higher price for his supplies than is justified. Speaking on this matter, Mr. G. Harold Powell, Former Officer in Charge of Fruit Transportation in the United States Department of Agriculture, and now General Manager of the Californian Fruitgrowers' Exchange, in his publication, "Co-operation in Agriculture," published during the current year, says: "The American farmer has adjusted himself more slowly to these industrial and social changes than either capital or labour. The reasons for this are partly inherent in the man who works on the land and partly in agriculture itself. The average farmers are not even specialists in farming. They produce a variety of general crops, each having to be handled and marketed through different channels. The supplies which they use are variable, and are secured from different sources. It is only when they become specialists in a crop in which a large community is interested, like apples, oranges, tobacco, potatoes, or cotton, and have to develop special facilities for the handling and distribution of the crop, that a group of farmers have a common purpose comparable to the aims of a large manufacturer or to those of a trade or industrial union. They are confronted with similar questions of public policy, they purchase similar supplies, they seek similar markets, they have to face the same questions of production, of transportation, of distribution and of sale." These are the words of the man who is managing the largest co-operative concern connected with the fruit-growing industry in the world.

The organization of which he is the manager acts as a distributory agent on behalf of the different fruit co-operative associations, representing something like 65 per cent. of the citrus fruit crop of California, which now equals nearly 50,000 car loads of 20,000,000 boxes, valued at from 20,000,000 to 32,000,000 dollars (approximately £7,000,000 to £8,000,000) per annum.

The Exchange acts as a clearing house in providing the facilities through which 6,500 growers distribute and market their fruit. More will be said later of this Exchange and its method of transacting business, but the facts just quoted are sufficient to show that the words of the Manager of an organization of such gigantic proportions are worthy of the greatest respect.

The Average Farmer Conscious of being Exploited.

The average farmer is more or less conscious of the fact that he is not receiving the same value for his industry as many other sections of the community. He feels that his labour and efforts are being exploited, and that he does not receive a proportionate reward for his share in primary production as do those who are interested in placing the products before the consumer. His grievances in this direction are often well founded, but in many instances they are magnified by his want of knowledge of business affairs and of transactions outside his own occupation generally. He is prone to underrate the value of the work performed by other sections of the community and is also to a great extent suspicious of the methods of those engaged in transactions which do not come under his observation, and which therefore lie outside his knowledge. This suspicion in the mind of the farmer, whilst creating in him a feeling of antagonism towards those with whom he conducts his business transactions, is at the same time a powerful factor in operating against any movement towards his organization for the

purpose of removing the disabilities of which he may be conscious. He suspects anyone who approaches him with proposals for his relief, thinking doubtless that it is better "to bear those ills he has than fly to others that he knows not of."

(To be continued).

DAIRYING IN THE BALLARAT DISTRICT.

(By A. J. Ross, Dairy Supervisor.)

One of the most up-to-date dairy farms in the Ballarat district is that owned by Mr. S. J. Thomas, of Ascot, who is a firm believer in feeding his cows liberally, and is not content, as too many are, to trust to natural pasture only. Even in the flush of the season a ration of bran and chaff is fed each milking, which is relished by the cows, even when coming directly off the clover pasture. In season, maize and mangolds are grown, as also are various cereal mixtures for green feed. A liberal supply of clear spring water is always available. All the labour on the farm is supplied by the family. The following table shows a one-day test of the herd made by the writer:—

Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat.	Weekly Value at 1s. per lb.
						£ s. d.
1. Till	68	9¾	34	4.1	1.394	0 9 9
2. Pansy	72	10¼	42	4.5	1.890	0 13 3
3. Daisy	150	21½	34	4.95	1.683	0 11 9
4. Canary ..	56	8	30	5.55	1.665	0 11 7
5. Lucy	300	43	30	5.0	1.500	0 10 6
6. Betty	480	68½	18	6.2	1.116	0 7 9
7. Cherry	56	8	36	5.1	1.836	0 12 10
8. Maggie ..	135	19¼	46	4.55	2.093	0 14 7
9. Bess	14	2	50	4.5	2.250	0 15 9
10. Nancy	305	43½	29	4.5	1.305	0 9 1
11. Beauty.. ..	60	8½	50	5.2	2.600	0 18 2
12. Magpie ..	28	4	20	5.6	1.120	0 7 10
13. Dot	60	8½	39	6.1	2.379	0 16 7
14. Dahlia	42	6	25	5.25	1.312	0 9 2
15. Newry	60	8½	41	5.25	2.152	0 15 0
16. Queenie ..	340	48½	16	5.3	.848	0 5 11
17. Mousie ..	90	13	24	5.1	1.224	0 8 6
18. Golden Lass ..	30	4½	45	5.4	2.430	0 17 0
19. May	14	2	50½	4.95	2.490	0 17 6
					33.286	11 12 6

This gives an average return of 1¾ lbs. of butter fat per cow daily equal to 12s. 3d. for each cow weekly.

The herd comprises mostly grade Jerseys. There are three pure Jerseys eligible for the Stud Book and two pure Ayrshires in the herd. The two leading cows in the test are grade Jerseys.

The three Jerseys are: Canary 1.665 lbs., Golden Lass 2.43 lbs., and Dahlia 1.312 lbs. of butter fat. The latter cow was not at her best for a test, as she had recently been tapped following an attack of "Hoven" or blown on the clover. On a test previously carried out by Mr. Thomas 2 lbs. 3 oz. of butter was made from this cow.

Daisy, a pure bred Ayrshire cow, 150 days in milk, gave 34 lbs. of milk in the two milkings, producing 1.683 lbs. of butter fat. Lucy, 300 days in milk, 1.5 lb. butter fat. Queenie, 340 days in milk, is a three year old grade Jersey heifer. Magpie is a two year old heifer, Ayrshire and Jersey cross.

For a check test Mr. Thomas separates one cow's milk for the day and churns it separately, and unless a cow can show on or about 2 lbs. of butter per day he has no use for her, and she is generally sold in the market, or privately, there being a big demand for even the cull cows on account of their butter fat reputation. The cows are not housed in the winter, but are rugged. Hedge and pine tree shelter is provided in and around the homestead block and paddocks. In the near future Mr. Thomas intends to increase his herd to about 30 cows. In conjunction with the dairy farm are some very fine specimens of Berkshire breeding sows. The young boars, by a well bred sire, kept by Thomas Bros. adjoining, command a high price, ten guineas being paid for the pick. Mr. Thomas is a keen competitor at the local shows, and a large percentage of prizes is obtained annually.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation and Green Manuring.

The dryness of the present season has proved the great necessity for continuous cultivation, and the absence of rain, combined with the very hot weather, has greatly reduced the supplies of soil moisture. Where the trees have been irrigated it is just possible that many of them will burst into flower. The flowers should be removed so as to prevent the fruit from setting. If the fruit does set the tree will produce a reduced crop next season.

If not already done, and orchard conditions demand it, there is still *time to put in a leguminous crop for green manuring purposes.* But this should be done as early as possible, so as to give the crop a chance to make some good early growth.

Soils deficient in humus, or organic matter, are always benefited by a crop of green manures. Where stable manure is unprocurable the green manure crop is the only means of adding any organic matter to the soil.

Pest and Diseases.

All codlin moth bandages should be removed after the ploughing, and burned. It is not advisable to remove them before ploughing, as some larvæ certainly shelter under clods, and in the soil; the cultivation disturbs them and causes them to find a fresh hiding place.

All secondhand and odd cases should be thoroughly overhauled. It is preferable to do this now, instead of leaving it till spring, when the rush of duties will certainly prevent such work being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite (red spider); and this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Vegetable Garden.

This is the best month for the removal, transplanting, and subdivision of such garden plants as rhubarb, mint, horse radish, thyme, &c. Before planting out the ground should be deeply stirred, and well mixed with old decomposed manure. The deeper the working, the more profitable will be the results. *Topp's Winter, Stone's Ever Bearing Ruby,* and Early Albert rhubarbs are popular and profitable varieties to grow.

Asparagus beds should be attended to, and the tops cut off before the seeds have a chance to drop on the ground. If allowed to do so they will germinate and grow, and the seedlings will become a nuisance in the later season, and the worst weed in the bed. The tops should be removed as soon as the seeds are ripening. The ground should then receive a good manurial dressing. Well rotted stable manure is very beneficial, or, if obtainable, a good top dressing of seaweed is also valuable. Formerly a heavy dressing of salt was given on all asparagus beds, but experience has shown that the presence of salt is not at all necessary to the development and growth of the plant. Further, analyses of asparagus show that, of all ingredients in the composition of the plant, salt is in the lowest percentage.

The most perfect fertilizer for asparagus is a mixture of 2½ cwt. sulphate of ammonia, 2 cwt. sulphate of potash, and from 4 to 5 cwt. of bonedust per acre. This will supply a fair amount of nitrogen, potash, and phosphoric acid in the proportion required by the plants. Asparagus is a gross feeder, and the plant requires abundant food, in an available form, and within easy reach, during its growing period. The most successful practice in manuring asparagus is to top dress with stable manure in the autumn, and then to feed with chemical fertilizers in early spring. In preparing new asparagus beds the ground should be very deeply dug, a depth of from 2 to 3 feet being not at all excessive. A good, rich, friable soil is required; and a good mixture of well rotted stable manure should be thoroughly worked into the bed, which must be well drained. It is not essential to place large quantities of manure in the bottom of the bed or of the trenches. This is a wasteful practice; the plant will thrive far better in a fairly compact soil, which has been well worked with manure, and fertility and productiveness will be maintained by the regular top dressings.

Onion seeds may now be sown for transplanting in the winter; the most useful varieties are the Brown Spanish and the Early Golden Globe.

Specimens of the latter variety, if well grown and given plenty of room, may easily be obtained up to one pound in weight.

Continue to plant out cabbage, cauliflower, and other seedlings. Plant also early peas and broad beans.

Flower Garden.

GARDEN HEDGES.

An opinion has recently been expressed that householders do not generally consider the question of planting a better variety of plants for hedge purposes. The constant repetition of Pittosporum, Privet, Cypress, and Coprosma makes a street or a district very monotonous. Occasionally one will find that, as an innovation, some gardener has been brave enough to vary the monotony, and the result is always pleasing. A charming hedge may be composed of roses, using either one kind or a good selection of varieties that will harmonize in colour. Suitable roses for this purpose are—Madam Abel Chatenay, Gruss an Teplitz, Sunset, General McArthur, Cecil Brunner, and Mary Countess of Ilchester. The summer cypress, Tamarix Gallica, and Tamarix Japonica, make a very fine hedge, decorative and quick growing. The masses of pale-pink flowers in late summer are not the least attractive feature of the hedge. If cuttings are planted in June, and properly cared for, they will easily grow to a height of 6 or 7 feet in the first season. Of course, these should be pruned back in the winter. One of the hawthorns (Cratægus crenulata) makes a very decorative hedge. The foliage is small and dark-green, and forms a good set off for the pale flower clusters which come in spring time; but the most striking feature of this evergreen shrub is the masses of orange-scarlet berries which come in early autumn. Another useful hedge plant, and one which remains in flower for many months, is the English Broom. This plant is quick growing, and requires severe pruning after flowering. Our native tea tree, Leptospermum lævigatum, which is so common along the coast, readily responds to hedge culture. It flowers well as a hedge, and may be relied upon to respond even to a severe pruning. Another native plant, very suitable for hedges, is the Boobyalla, or Myoporum insulare. The hedge of this plant near the Brighton Railway Station, is much admired by all who see it. Several of the Japanese Bamboos also make an excellent hedge, and one of these may be seen in the Melbourne Botanical Gardens.

In fact, any good strong-growing shrub, one which is not too tall, will make a very suitable hedge; and if it be only remembered in horticulture, as in many other things, that variety is charming, there will, in the future, be much less monotony in the matter of garden hedges.

GENERAL.

The garden can generally be depended upon to make a good show in the autumn months, provided that the plants have been previously kept in a healthy state by watering, mulching, and feeding. The question of plant foods should be given far more consideration in the autumn than at any other time of the year. Not only because the most popular flowers—roses, chrysanthemums, and dahlias—are then in vogue, but more because the soil requires a stimulus, and, in, addition, after the trying, heating weather of summer, and also after the leaching or soil washing effects of frequent summer waterings. So that, in order to impel our rose bushes, our chrysanthemum, and other plants to give their

best results, they should be fed weekly with liquid or chemical manures up to the time of blooming. Then the feeding should cease as the plants require no further stimulus.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs, and herbaceous divisions, should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once. It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now, while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish themselves in their new location before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in roots and crown, with the advent of the first spring weather. When planted in winter they have no chance to grow, the roots remain as when planted, and with every chance of rotting in the cold wet soil, the foliage becomes yellow and debilitated, and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. Then, of course, the season that has been lost can never be regained. Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great liking for such succulent growths. A good surface dressing of broken leaf or dust tobacco will effectively deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust form, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties, which are also valuable.

Pansy and other seedlings, also rooted layers and cuttings may now be planted out in their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

THIRD VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1913-14.

MONTHLY REPORT, ENDING 14TH MARCH, 1914.

No rain has fallen during the past month, with the exception of one shower, which was too light to be able to be recorded.

The heat has again been very trying to the birds, the temperature frequently recording over 100 deg. Fahr. in the houses.

The dust baths have been sprinkled regularly, and the roofs of the houses cooled by means of the hose pipe. The birds, however, are all laying well and maintain a good supply of eggs.

The leading pen No. 23 (J. H. Gill) is now well ahead of last year's total, and, with four and a half weeks still to go, is getting close to the previous Burnley record. The competition for the next few places on the list promises to be very keen.

An increased supply of green food has been fed to the birds, the food otherwise being the same as last month.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner.	Eggs laid during Competition.			Position in Competition.
			April 15 to Feb. 14.	Feb. 15 to Mar. 14.	Total to date—11 months.	
23	White Leghorns ..	J. H. Gill	1,422	112	1,534	1
35	.. ..	Moritz Bros. ..	1,316	125	1,441	2
11	.. ..	C. J. Beatty ..	1 321	98	1,419	} 3
31	.. ..	W. G. Swift ..	1,287	132	1,419	} 3
8	.. ..	E. H. Bridge ..	1,310	108	1,418	5
48	.. ..	Thirkell and Smith ..	1,300	104	1,404	6
6	.. ..	J. S. Spotswood ..	1,303	96	1,399	7
7	.. ..	H. McKenzie ..	1,279	117	1,396	8
20	.. ..	C. B. Bertlesmeier ..	1,255	125	1,380	9
10	.. ..	T. A. Pettigrove ..	1,264	110	1,374	10
5	.. ..	G. W. Robbins ..	1,252	119	1,371	11
50	.. ..	A. H. Mould ..	1,237	124	1,361	12
34	.. ..	J. E. Bradley ..	1,228	122	1,350	13
40	.. ..	G. E. Edwards ..	1,232	115	1,347	14
66	.. ..	W. Featherstone ..	1,211	110	1,321	15
24	.. ..	Redfern Poultry Farm	1.193	125	1,318	16
21	.. ..	A. Ross	1,217	94	1,311	17
67	.. ..	C. Hepburn ..	1.193	111	1,304	18
65	.. ..	E. A. Lawson ..	1,229	73	1,302	19
49	.. ..	M. H. Noye ..	1,198	101	1,299	20
2	.. ..	R. W. Pope ..	1,210	82	1,292	21
61	.. ..	Jno. Campbell ..	1,180	102	1,282	22
33	.. ..	South Yan Yean Poultry Farm ..	1,156	115	1.271	23
32	.. ..	H. Hanbury ..	1,177	84	1,261	24
26	.. ..	B. Rolls	1,173	86	1,259	25
41	.. ..	Percy Walker ..	1,157	88	1,245	26
14	.. ..	F. Hannaford ..	1,136	104	1,240	27
58	.. ..	Stranks Bros ..	1,142	82	1,224	28
12	.. ..	A. H. Padman ..	1,115	108	1,223	29
52	.. ..	W. G. Osborne ..	1,113	105	1,218	30
37	.. ..	C. H. Busst ..	1,122	91	1,213	31
47	.. ..	W. McLister ..	1,109	92	1,201	32
45	.. ..	D. Goudie	1,097	100	1,197	33
57	.. ..	Gleadell Bros. ..	1,089	101	1,190	34
63	.. ..	A. Sellers	1,113	72	1,185	35
62	.. ..	G. A. Gent ..	1,078	91	1,169	36
56	.. ..	Schaefer Bros. ..	1,072	96	1,168	37
44	.. ..	W. A. Rennie ..	1,065	102	1,167	38
27	.. ..	J. Sinclair	1,051	103	1,154	39
29	.. ..	S. Brundrett ..	1,038	114	1,152	40
43	.. ..	Morgan and Watson	1,077	72	1,149	41
3	.. ..	S. Buscumb ..	1,062	85	1,147	42
13	Black Orpingtons ..	T. S. Dallimore ..	1,069	76	1,145	43
22	White Leghorns ..	B. Mitchell ..	1,051	93	1,144	44
18	.. ..	B. Rowlinson ..	1,055	85	1,140	45
30	Black Orpingtons ..	Jas. Ogden ..	1,003	125	1,128	46
42	White Leghorns ..	A. Stringer ..	1,048	75	1,123	47
59	,, ..	Cowan Bros. ..	1,037	82	1,119	48
38	,, ..	M. A. Monk ..	1,047	68	1,115	49
36	.. ..	A. J. Jones ..	996	89	1,085	50
51	Black Spanish ..	W. H. Steer ..	988	91	1,079	51
46	Black Orpingtons ..	T. W. Coto ..	1,000	64	1,064	52
54	White Leghorns ..	Jas. McAllan ..	994	58	1,052	53
60	Black Spanish ..	Watson and Rushworth	940	107	1,047	54
55	White Leghorns ..	P. H. Killeen ..	971	73	1,044	55
53	Black Orpingtons ..	A. Greenhalgh ..	975	64	1,039	56
25	.. ..	King and Watson ..	950	65	1,015	57
17	R.C. Brown Leghorns	S. P. Giles	903	80	983	58
28	White Leghorns ..	E. Waldon	907	61	968	59
64	Golden Wyandottes	C. L. Sharman ..	880	74	954	60
4	White Leghorns ..	Jas. Bridgen ..	861	88	949	61
9	,, ..	Sylvania Stud Farm	847	69	916	62
15	,, ..	J. Shaw	806	81	887	63
		Totals ..	70,107	5,964	76,071	

REMINDERS FOR MAY.

LIVE STOCK.

HORSES.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

PIGS.—As recommended in Reminders for April.

SHEEP.—Attend lambing ewes every morning, especially merinoes if lambing to rams of larger breeds. Comeback and first cross ewes commence lambing about now. At same time as crutching for fly, clip wool from round the udders of well-woolled ewes; this enables many lambs to live through stormy nights that would otherwise die. Allow for sufficient feed in lambing paddocks, for hungry ewes are always bad mothers. Class ewe flocks, and keep all shapely well-woolled ewes; prepare the inferior ones for sale as fats. All meat will be dear this winter. Do not leave lamb-marking late. In fine weather, ram lambs can be castrated when a few days' old, whenever and wherever they can be caught, no assistance to hold them being necessary.

POULTRY.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts, to avoid colds. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

FARM.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

ORCHARD.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

FLOWER GARDEN.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

VEGETABLE GARDEN.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

VINEYARD.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains. Applications for grafted resistant rootlings for 1915 must be made before end of May. See article in this issue.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.

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GOVERNMENT CERTIFICATION OF STALLIONS.

SEVENTH ANNUAL REPORT (SEASON 1913) ON THE VETERINARY EXAMINATION OF STALLIONS FOR GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

Seven years having elapsed since the inauguration of the scheme for the Government certification of stallions, it is appropriate to review the reasons which led to the introduction of the scheme and to analyze the results in an endeavour to see how far the object has been fulfilled, and to consider whether further action is justifiable in order to bring to fruition the objects desired.

The scheme was introduced to meet, in some degree, the wishes of the majority of horse breeders that action should be taken to improve the position of the industry. It was felt that this could be carried out to a considerable extent with the co-operation of the breeders by introducing a voluntary scheme and the issuing of certificates to horses free from hereditary unsoundness and of suitable type. To bring the project to a successful issue it was necessary to have the support of stallion owners who would submit their horses for examination, and, further, the support of breeders who would mate their mares with such horses, as against the non-certificated ones, with the result that the progeny would not be depreciated in value owing to hereditary unsoundness, and that, further, breeders would be assisted in distinguishing the nondescript sires. The system quickly met with approval on all sides, which is a fine testimony of the foresight and intelligence of breeders, as well as to the tact exercised by the veterinary officers conducting the examinations. The other States of the Commonwealth realizing the benefits soon followed the lead given and introduced similar systems.

The figures given at a latter stage of this report will indicate that in the elimination of unsoundnesses the scheme promises to be entirely successful. During the year 1907 the total number of horses examined was 918, of which number 15.04 per cent. were rejected as unsound,

whilst in 1913, 963 were examined and 10.38 per cent. rejected for this reason. This reduction in the short space of seven years cannot be regarded as other than satisfactory. Examination of the figures dealing with the unsoundness which is most prevalent, viz., "Sidebone," in draught horses, is found to be even more satisfactory, for during the first year 20.78 per cent. of animals were found so affected, whilst only 8.5 per cent. were rejected last season. This unsoundness may, as a matter of fact, be taken as an index of the value of the system, for the numbers rejected under other heads are so small that a slight difference in totals makes a large percentage of difference.

It may therefore be fairly claimed that the main object of the scheme is being achieved, at least so far as the production of sires is concerned. This must also apply to a large number of the rank and file of horses born. There still exists, however, a large number of uncertificated horses which are travelling the State, which apparently are obtaining a number of mares at reduced fees and so continuing the unsoundnesses to further generations. It therefore becomes a question for careful consideration on the part of breeders as to whether the time is not now ripe for the prohibition of the use of unsound and inferior sires by means of legislation, and so bring the objects of the present scheme to their complete and logical conclusions. That the prohibition of the use of unsound and inferior sires would act beneficially upon the industry is a foregone conclusion in the light of the result of the seven years' trial of the voluntary system, which may be further supported by an analysis of the cause of the slump in draught horses during the last sales.

In order to ascertain the cause it is necessary to go back a few years to what might be termed the "Boom in draught horses," when, owing to the cutting up of large estates, and the closer settlement resulting, draught horses were in steady demand at high prices. At that time the New Zealand trade was in the hands of a comparatively few traders. The high prices ruling, however, drew the attention of two other bodies of men to its possibilities. Firstly—large numbers of Victorian farmers thought they should keep the trade within our own shores and reap some of the harvest which had been flowing over-sea. The principle is sound, and one which has always been advocated by the veterinary officers of this division. The equilibrium of the market, however, had not been gauged, and the result was that a very large number of farmers, in their desire to participate, decided to enter the industry as horse breeders—not realizing that the business is founded on certain fundamental laws. Unfortunately, a large number of inferior sires were, at the time, on the market, with the magic initials "IMP" after their name. The full effect of this flooding of the State with stallion owners was not to be felt for some three years. Secondly—the eyes of New Zealand breeders themselves were turned towards Victoria as a "happy hunting ground." Until this time a horse of fairly satisfactory quality had been introduced, but the "boom" induced a large number of these breeders to enter the arena as importers, and to save as stallions almost every colt produced, in the hope of obtaining three figures. From this quarter, therefore, a large number of "Scrubbers" was introduced.

The result of these two factors operating has been the flooding of the market with stallions which, as was seen at the last sales, have

been disposed of at less than gelding prices. That many losses were experienced is evident, for many of the animals submitted at the last sales had been held over from the previous year.

The following tables will serve to support this contention:—

HORSES IMPORTED FROM NEW ZEALAND.

Year.	Draughts.				Lights.				Grand Total.
	Stallions.	Mares.	Geldings.	Total.	Stallions.	Mares.	Geldings.	Total.	
1910–11	292	1,786	758	2,836	11	16	10	37	2,873
1911–12	246	452	208	906	12	35	14	61	967
1912–13	173	113	40	326	4	19	9	32	358

HORSES IMPORTED FROM ENGLAND.

Year.	Shires.	Clydesdales.	Thoroughbreds.	Other.	Total.
1910–11 ..	51	4	65	14	134
1911–12 ..	67	38	39	27	171
1912–13 ..	7	3	62	3	75

DRAUGHTS IMPORTED FROM THE UNITED KINGDOM AND NEW ZEALAND.—OFFERED AT THE MELBOURNE HORSE SALES, JULY, 1913:—

Imported from.	Stallions.					Mares.					Grand Totals.
	Age.				Total.	Age.				Total.	
	3 Yrs.	4 Yrs.	5 Yrs.	Over 5 Yrs.		3 Yrs.	4 Yrs.	5 Yrs.	Over 5 Yrs.		
United Kingdom	16	10	4	1	31	..	..	..	..	..	31
New Zealand ..	122	51	19	23	215	23	29	24	46	122	337
Totals ..	138	61	23	24	246	23	29	24	46	122	368

These tables will serve to indicate that a number of horses had been held over from the previous year. In considering the table along with the import tables above, it must be borne in mind that many of the importations were private, and that others would be sold privately prior to the Melbourne sales. The three and four year olds from the United Kingdom were almost all held over from the previous year, whilst the three-year-old New Zealanders may be regarded as this year's importations only. Those over five years old would represent re-sales owing to a desire to introduce a change of blood.

The first serious drop in the market occurred last year, when, owing to the dry winter experienced, workers were not in active demand. The imports from New Zealand reflected this by being 1,910 less than for the year 1910-11.

During the past season a further drop was experienced, both in the number of imports and in prices realized. That good will eventuate from such depression there is little doubt, for the prospects of the industry cannot be otherwise than encouraging owing to the amount of closer settlement proceeding, all of which will require supply for working purposes. The year ended March, 1913, shows an increase of 22,681 head of horses over that for the previous year, but it is found that for heavy draughts, geldings, or mares, the market is still firm. The cause of the drop then, shortly stated, was the flooding of Victoria with inferior sires which, being cheap, induced many farmers to become stallion owners, and stand them at low fees. The result has been an over-supply of light draughts and delivery types; the remedy, the breeding of heavier types from animals of fixed type. Legislation would, to a considerable extent, act beneficially, for it would result in fewer stallions of better type being kept to the distinct advantage of the industry. In respect of the low average obtained last season, colts of good quality have all through, found sales at satisfactory prices, and there is every indication that those breeders who have considered the principles which govern their business show an increasing desire to improve their stud by the introduction of English and Scottish blood—not simply by the variety whose only claim to distinction is "IMP," but by quality as the first essential.

Review of the Past Season.

For the year ended 31st March, 1914, a total of 160 parades was attended by the veterinary officers, the bulk of such parades having been carried out in a period of seven weeks, or an average of five parades a week by each officer engaged during that period, and I desire to express my appreciation of the manner in which the work was executed and the tact displayed in conducting the parades without a hitch.

The accompanying table shows the number of horses examined and the actions taken by the individual officers concerned in the examination during the past season.

Officer.	Number Examined.	Number Certificated.	Number Rejected.	Per cent. Rejected.
Mr. E. A. Kendall, B.V.Sc.	342	255	87	25·44
Mr. R. Griffin, M.R.C.V.S.	375	248	127	33·86
Mr. R. N. Johnstone, B.V.Sc. ..	213	147	66	30·98
Mr. G. G. Heslop, B.V.Sc.	23	18	5	21·74
Appeal Boards	11	2	9	81·82
Totals ..	964	679	294	30·50

Examinations and Rejections.

During the year a total of 963 horses was examined, of which number 294, or 30.53 per cent. were refused certification—an increase

over the previous year, when the total was 954, and the percentage rejected 21.8 per cent. Analysis of the table shows the increase is entirely due to the higher standard for approval which was required in 1912-13—the rejections under this head being 10.27, whilst for last year 20.14 were refused under this heading. The following table will show that this increase is distributed amongst the draught and light horses.—

Table Showing Percentage of Rejections for "Disapproval" for the Years 1912–1913.

Year	Draught.	Light.	Ponies.	Total.
1912	7·92	10·07	35·71	10·27
1913	18·38	24·84	26·14	20·14

The following table shows a complete analysis of the rejections during last year:—

Analysis of Defects of Rejects, Season 1913–14.

	Draughts.		Light.		Ponies.		Totals.	
—	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	718	507	157	102	88	60	963	669
	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.
Unsoundness.								
Sidebone ..	61	8·50	1	·64	...	...	62	6·44
Ringbone ...	9	1·25	2	1·27	...	...	11	1·14
Spavin (Bone)	2	·28	9	5·73	3	3·41	14	1·45
Bog Spavin .	3	·42		...	..	...	3	·31
Curb ...	1	·14	4	2·55	2	2·27	7	·73
Roaring ...	1	·14	...	...	...	...	1	·10
Shivering ...	2	·28	...	...	...	...	2	·21
Nasal Disease	...	...	...	...	...	..	...	...
Total unsoundnesses	79	11·00	16	10·19	5	5·68	100	10·38
Disapproved	132	18·38	39	24·84	23	26·14	194	20·14
Total rejected	211	29·39	55	35·03	28	31·82	294	30·53

As already indicated the best index of the value of examination may be found in the draught horses, by virtue of the fact that of the larger number examined a fair comparison may be made, whilst in dealing with small numbers, one additional rejection makes considerable difference in results.

Comparison, therefore, amongst the draughts—of which 718 were examined—shows a fall in the total of rejection from 12.03 to 11.0 per cent., due almost wholly to the fall on account of ringbone, for which 1.25 per cent. were rejected, as against 2.03 for the previous year. In respect of sidebone there is also a small fall from 9.46 to 8.50 per cent.

As an indication of the effect of examinations the following table, which deals only with the hereditary unsoundness, "Sidebone," in draughts, is interesting:—

—	1907.	1908.	1909.	1910.	1911.	1912.	1913.
No. Examined	385	501	408	542	692	745	718
No. Rejected for "Sidebone"	80	99	84	103	58	70	61
Percentage	20·78	19·76	20·59	19·0	8·38	9·46	8·50

In considering the above, it must be borne in mind that during the earlier years large numbers of aged stallions were submitted, whilst from 1910 and onwards certificates for the season only were issued in respect of three and four year olds, and by that time most of the aged horses throughout the State had been examined.

Experience has shown, as has already been admitted, that breeders, and more especially those with stud mares likely to breed stallions, have given the scheme their entire support, with the result that only sound sires have been used for the production of stud animals, with the pleasing result as shown in the above table.

RE-EXAMINATIONS.

Three hundred and seventy horses were presented for examination which had previously held certificates—the result of such examinations being shown in the following table:—

HORSES SUBMITTED FOR RENEWAL OF CERTIFICATES—SEASON 1913/14.

Age.	Passed.	Rejected.	Per cent. Rejected.	Totals.
3 years	12	9	42·86	21
4 ,, ...	128	33	20·50	161
5 ,, ...	158	30	15·96	188
Totals ..	298	72	19·46	370

TRANSFERRED CERTIFICATES.

The number of certificates presented for transfer for Victorian Government certificates is as follows:—

United Kingdom	10
New Zealand	59
New South Wales	1
Tasmania	1
Total	71

Some considerable comment was made during the last sales upon the number of inferior sires which held Government certificates whilst it was known that many of better type had been refused. The explanation is shown in the above table, where it will be observed that 59 New Zealand certificates were presented for transfer under the regulations. It is provided that a Victorian Government certificate shall be issued in respect of certificates issued by certain Governments and other

bodies. This agreement is strictly adhered to, but it was found that the officers of the New Zealand Department were issuing certificates to any horse which, on examination, was found to be sound—the power of rejection as being below type not being exercised except in very bad cases

This anomalous position has been rectified, and for the future the standard in New Zealand will be considerably raised, so it is hoped that for the future complaints on this score will not be justified.

Appeals.

The number of appeals lodged against rejection by Government officers was eleven, which may be taken as an indication of the confidence reposed in them by the owners of stallions. Of this number six were on the question of "Disapproval," and five in respect of "Unsoundness." Boards of Appeal were in due course constituted and certificates issued in respect of two of those formerly rejected as unsound, the Board being satisfied that injury and not hereditary unsoundness was responsible. The remainder, viz., nine, were refused.

Alteration to Regulations.

At the Conference of Ministers for Agriculture, held on the 13th and 14th February, 1913, at Hobart, a resolution was carried "that it is advisable that there should be uniformity within the Commonwealth in regard to the examination and certification of stallions, and that a conference consisting of the chief veterinary officers and heads of the Departments be held in Sydney at an early date to deal with the matter. As the outcome of this resolution a conference was arranged to sit in Sydney commencing on 16th April, at which representatives were present from New South Wales, Victoria, Queensland, and Tasmania. South Australia and Western Australia were unable to send representatives, but the former State intimated that it would fall in with the decisions of the Conference as far as possible. Consideration was given to the matter for a period of three days, and it was finally decided that uniformity of examination and certification of stallions could be attained throughout the States of the Commonwealth. Uniform regulations were accordingly adopted and submitted to the Ministers of the various States. It is worthy of record that the regulations so agreed upon were practically those which have been in operation in Victoria for the past two seasons—the only alterations of note being the inclusion of "Cataract," "Navicular Disease," "Stringhalt," and "Whistling" as hereditary unsoundnesses, for which certificates should be refused. It was further resolved that the Conference recommend that early legislation be enacted to provide that, (a) uncertificated horses should not be allowed to travel or stand for public stud purposes: (b) in the interests of the scheme for the examination and certification of stallions it is highly desirable that stud books for the recognised breeds of horses should be established in each State forthwith. The Regulations submitted herewith are, therefore, those which are in force in all States of the Commonwealth. The additions to those which were in force in Victoria during the past season are the unsoundnesses already indicated, and a definition of 3, of the unsoundness met with (Part II., Clause (2) of the Regulations) and a Regulation providing for the Inter-State notification of Rejects as early as practicable after examination has taken place. The accompanying table gives a *résumé* of the seven years' operations:—

Summary of Seven Years' Work, 1907-1913.

Season.	Draughts. Examined.	Draughts. Certificated.	Draughts. Rejected.		Draughts. Percentage.	Lights. Examined.	Lights. Certificated.	Lights. Rejected.		Lights. Percentage.	Ponies. Examined.	Ponies. Certificated.	Ponies. Rejected.		Ponies. Percentage.	Totals. Examined.	Totals. Certificated.	Totals. Rejected.		Totals. Percentage.
1907–8 ..	403	271	Unsound	96	23·82	301	246	Unsound	32	10·63	214	186	Unsound	10	4·67	918	703	Unsound ..	138	15·04
			Disapproved	36	8·93			Disapproved	23	7·64			Disapproved	18	8·41			Disapproved	77	8·38
				132	32·75				55	18·27				28	13·08				215	23·42
1908–9 ..	501	341	Unsound	137	27·33	295	242	Unsound	29	9·83	199	159	Unsound	5	2·5	995	742	Unsound ..	171	17·17
			Disapproved	23	4·59			Disapproved	24	8·13			Disapproved	35	17·58			Disapproved	82	8·24
				160	31·92				53	17·96				40	20·10				253	25·41
1909–10 ..	410	275	Unsound	96	23·52	191	147	Unsound	12	6·27	156	112	Unsound	5	3·29	757	534	Unsound ..	113	15·04
			Disapproved	39	9·56			Disapproved	32	16·77			Disapproved	39	25·65			Disapproved	110	14·65
				135	33·08				44	23·04				44	28·94				223	29·69
1910–11 ..	542	387	Unsound	117	21·57	143	108	Unsound	15	10·53	128	101	Unsound	7	5·47	813	596	Unsound ..	139	17·09
			Disapproved	38	7·01			Disapproved	20	14·08			Disapproved	20	15·62			Disapproved	78	9·6
				155	28·58				35	24·61				27	21·09				217	26·69
1911–12	692	554	Unsound	84	12·13	165	120	Unsound	13	7·87	122	83	Unsound	5	4·09	979	58	Unsound ..	102	10·42
			Disapproved	54	7·8			Disapproved	31	18·78			Disapproved	34	27·86			Disapproved	119	12·15
				138	19·94				44	26·66				39	31·96				221	22·57
1912–13 .	745	597	Unsound	89	12·03	139	106	Unsound	19	13·67	70	43	Unsound	2	2·85	951	746	Unsound ..	110	11·59
			Disapproved	59	7·92			Disapproved	14	10·07			Disapproved	25	35·71			Disapproved	98	10·27
				148	19·73				33	23·74				27	38·57				208	21·81
1913–14 ..	718	507	Unsound	79	11·0	157	102	Unsound	16	10·19	88	60	Unsound	5	5·68	963	669	Unsound	100	10·38
			Disapproved	132	18·38			Disapproved	39	24·84			Disapproved	23	26·14			Disapproved	194	20·14
				211	29·39				55	35·03				28	31·82				294	30·53

REGULATIONS

GOVERNING THE EXAMINATION OF STALLIONS FOR THE GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

I.—EXAMINATION PARADES.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the Stallion owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations of Stallions for the Government Certificate will be made at such Parades or on some such publicly advertised occasion, *unless* under special circumstances as provided for in clause 5.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June*, after which no alteration in the Time Table can be made.

(5) The special examination of stallions for the Government Certificate of Soundness at other than the advertised stallion parades may be arranged for in cases where, through accidental circumstances, the owner has failed to submit the horse at such parade.

Such examinations will only be arranged when the attendance of the Examining Officer will not interfere with the requirements of the Department for his services in other directions.

An owner requesting such special examinations will be required to prepay a fee of £1 1s. for each horse examined; also the railway fare (first class return), and travelling expenses at the rate of 14s. per day, of the visiting officer.

II.—GROUNDS FOR REJECTION.

(1) Refusal of Certificate on the ground of unsoundness will be made only when, in the opinion of the Examining Officer, the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses, viz.:—

Bog Spavin	Ringbone
Bone Spavin	Roaring
Cataract	Sidebone
Chorea "Shivering" or "Nervy"	Stringhalt
Curb	Thoroughpin
Navicular disease	Whistling
Nasal disease (Osteo-porosis)	

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of

the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) For the purpose of these regulations the following shall be the definitions of "Ringbone," "Sidebone," and "Curb":—

(*a*) Any exostosis on the antero or lateral aspect of the phalanges below the upper third of the *Os Suffraginis* shall constitute a Ringbone;

(*b*) Any ossification of the lateral cartilage shall constitute a Sidebone;

(*c*) Any circumscribed swelling on the posterior aspect of the hock in the median line and within the limits of the lower third of the hock and the head of the metatarsal bones shall constitute a Curb.

(3) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation, and breeding.

(4) Stallions three or four years old, which are refused a Certificate as regards type, conformation, and breeding may be re-submitted annually until five years old, after which the refusal shall be subject to review under Part V. of these regulations only.

(5) In the case of horses that have been rejected for any reason whatsoever, a notification containing all particulars of identification shall be sent to all Chief Veterinary officers of the other States of the Commonwealth as early as practicable after such examination has taken place.

III.—CERTIFICATES.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the owner direct. Secretaries of Societies under whose auspices the Parade is held will be notified which, if any, of the horses submitted for examination obtain their Certificates.

(3) The owners of stallions for which a Certificate is refused will within seven days of such refusal be officially notified of the fact; the reason for such rejection will also be given.

(4) Until the issue of a Certificate, or until the publication of the official list of certificated stallions, the result of the Veterinary examination will not be communicated to any person except as herein provided or under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the Certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless they deliver to the officer the owner's signed authority to receive the

(5) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The Government Certificate of Soundness of any Australian State or New Zealand.

The Veterinary Certificate of the Royal Shire Horse Society (England).

The Veterinary Certificate of Royal Agricultural Society (England).

The Veterinary Certificate of Royal Dublin Society (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland).

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society.

The Veterinary Certificate of the Board of Agriculture and Fisheries (England).

The Veterinary Certificate of the Board of Agriculture (Scotland).

Provided that such horses have been examined in accordance with these regulations.

Any horse which has been rejected by the Veterinary Examiners for any of the above certificates will not be eligible for examination for the Victorian Government Certificate of Soundness.

(6) The form of the Victorian Government Certificate of Soundness is as follows:—"G.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion (*name and description of stallion*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Secretary for Agriculture."

(7) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

(8) The season in respect of Government Certificates shall be considered as opening on 1st July. Stallions passing the examination any

time during the three months previous to this date in New Zealand or Australia will be granted a Certificate for the season next following. In respect of stallions examined in Great Britain examinations on or after 1st January will be considered as examinations for the following season.

IV.—TENURE OF CERTIFICATE.

(1) Certificates issued during the season in respect of horses five years old and over are life certificates; those for three-year-olds and four-year-olds are season certificates only, and such horses must be submitted for re-examination at four and five years before a life certificate will be issued.

(2) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(3) The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

V.—BOARD OF APPEAL.

(1) Any owner of a stallion who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against, to be free from all the unsoundnesses set out in Part II. of these regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of:—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and *not subject to review.*

(3) In the event of the appeal being allowed, refund shall be made of the deposit, and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal or in such case as when a three or four years old stallion has been refused on account of type as herein provided for. In the event of any rejected stallion being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected stallion, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

NOTICE TO SECRETARIES OF AGRICULTURAL SOCIETIES.

Section "A" of the conditions to be complied with by Agricultural Societies before being eligible for participation in the annual Government grant is as follows:—

"*A.—That the awards of prizes in all classes for stallions, three years old and over, at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.*"

In order to comply with the above, the special attention of show secretaries is invited to the receiving of entries in stallion classes. No entry should be received unless at the time of entry the Government certificate is produced, or unless satisfactory evidence is given that a Government certificate is held by the owner in respect of the exhibit. The awarding of a prize card and the withholding of prize money in respect of any exhibit shall not be deemed as compliance with the condition. Care should be taken also to see that the certificate is not out of date, that is to say:—

For three year-olds, a 1914 three-year-old certificate must be held.

For four-year-olds, a 1914 four-year-old certificate must be held (the 1913 certificates are out of date).

For horses five years old and over, a life certificate must be held.

Particular attention is directed to the method now in vogue of classifying certificated stallions. The list is now divided into horses carrying a life certificate and those which are terminable, and supplementary lists will be issued annually which should be added to those listed in Bulletin No. 30, No. 17, and No. 21 (New Series).

Secretaries are strongly urged to become familiar with the regulations, particularly Regulation IV., which deals with the tenure of *certificates.*

Secretaries are required to *forward immediately after the show* a return (forms for which will be sent to each society) giving required particulars concerning 1st, 2nd, and 3rd prize winners as under:—

Return to be forwarded to the Chief Veterinary Officer concerning Stallions (three years old and over) awarded Prizes at the .... Agricultural Society's Show held ....

Name of Stallion.	Certificate Number.	Name of Class and Section (not Number).	Prize Awarded.			Owner's Name.	Owner's Address.
			1st.	2nd.	3rd.		

(Signed) ....

Secretary ... . Agricultural Society.

Date ....

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

DRAUGHTS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2509	Abbotsford	5 years	A. Colvin	Nathalia	13.8.13	R.G.
2430	Abbot's Pride	5 years	S. H. Wilson	Newmarket	21.7.13	E.A.K.
2547	Admiral's Champion	5 years	H. Cronk	Shepparton	22.8.13	R.G.
2510	Albion	5 years	Oakes Bros.	Nathalia	13.8.13	R.G.
2395	Aldfield Ben	6 years	O. T. Wills	Wedderburn (Special)	24.6.13	R.G.
2404	Attraction's Champion	5 years	W. Morley	Rutherglen	4.8.13	R.G.
2562	Australia's Favorite	5 years	M. Mahoney	Terang	25.8.13	E.A.K.
2564	Ballochmyle	5 years	P. McInerney	Port Fairy	26.8.13	E.A.K.
2406	Bardon Powerful	5 years	W. Price-Jones	Horsham	2.7.13	E.A.K.
2491	Baron Argyle	5 years	W. Hegarty	Donald	6.8.13	E.A.K.
2444	Baron Douglas	6 years	J. Smith and Son	Tasmanian Exam.	9.10.12	..
2438	Baron Fenwick	5 years	J. H. Sargood	Bendigo	24.7.13	E.A.K.
2616	Baron Gleniffer	5 years	S. J. Lynn	Orbost	7.10.13	R.G.
2486	Baron's Pride	5 years	J. Petrie, junr.	St. Arnaud	6.8.13	E.A.K.
2453	*Belted Ben*	*5 years*	*A. Giddings*	*Sea Lake*	*31.7.13*	R.G.
2445	Bladnock	5 years	L. H. Lanyon	Boort	29.7.13	R.G.
2431	Bold Baron	5 years	H. Jackman	Newmarket	21.7.13	R.G.
2531	Bonny Athol	5 years	H. W. Bidmade	Hamilton	19.8.13	R.N.J.
2588	Boro' Albert Victor	5 years	R. N. Scott	Korumburra	3.9.13	R.N.J.
2493	Boro' Sportsman	5 years	J. P. Belleville	Watchem	7.8.13	E.A.K.
2519	Bramhope Parthian	5 years	R. W. Renfrey	Geelong	14.8.13	E.A.K.
2454	Braw Scott	5 years	A. Sands	Sea Lake	31.7.13	R.G.
2462	Breedon Pioneer	5 years	M. C. Ryan	Edenhope	31.7.13	R.N.J.
2390	*Bridge Hill King*	*5 years*	*M. J. Caffrey*	*Newmarket (Special)*	*23.6.13*	*R.G.*
2396	Bury Spearman	5 years	F. W. Griffin	English Exam.	19.4.13	..
2605	Captain Dale	5 years	E. Roberts	Ballarat	12.9.13	R.G
2569	Carmichael	5 years	Gooden Bros.	Illowa (Special)	28.8.13	E.A.K.
2550	Carolyn	5 years	J. W. Dean	Mansfield	27.8.13	R.N.J.
2514	Carson's Fancy	5 years	J. W. Bennett	Swan Hill	13.8.13	R.N.J.
2402	Cast Iron II.	5 years	A. and J. H. Young	Horsham	1.7.13	E.A.K.
2461	Champion Again	5 years	Lee and Sons	Goroke	30.7.13	R.N.J.
2403	*Chieftain*	*6 years*	*J. McLean, junr.*	*Horsham*	*1.7.13*	E.A.K.
2583	Comet	5 years	Brock Bros.	Morwell	2.9.13	E.A.K.
2487	Coronation	5 years	G. Oxley	St. Arnaud	6.8.13	E.A.K.
2397	Cranbourne Stewart	5 years	E. J. Glossop	Agric. Offices	28.6.13	E.A.K.
2520	Creslow Kingmaker	5 years	Geelong Harbor Trust	Geelong	14.8.13	E.A.K.
2432	Defender	5 years	F. Jones	Newmarket	21.7.13	E.A.K.
2480	Defender	5 years	Hooper Bros.	Benalla	8.8.13	R.G.
2499	Dividend	5 years	M. Cann	Euroa	11.8.13	G.H.
2476	*Donibristle*	*5 years*	*Exors. late T. Wilson*	*Wangaratta*	*7.8.13*	R.G.
2411	Dreadnought	5 years	J. C. Rockliffe	Numurkah	9.7.13	R.G.
2424	Drummer's Style	5 years	N. Anderson	City Horse Bazaar	15.7.13	E.A.K
2506	Drummond King	5 years	C. Pearse	Pyramid	11.8.13	R.N.J.
2409	Dunsmore Ragged Jacket	5 years	W. Price-Jones	Horsham	2.7.13	E.A.K.
2391	Eaton Charmer	5 years	A. Austin	Newmarket	23.6.13	R.G.
2466	Elksley Commander	5 years	J. J. Carroll	Rutherglen	4.8.13	R.G.
2492	*Favourite*	*5 years*	R. C. *Hannah*	*Donald*	*6.8.13*	E.A.K.
2446	First Choice	5 years	R. H. Lanyon	Boort	29.7.13	R.G.
2399	Fortune Laddie	5 years	O. Bodey	Horsham	1.7.13	E.A.K.
2384	Fred	5 years	E. Parkes	New Zealand Exam.	2.4.13	..
2496	*Fyvie Blacon*	5 years	*A. J. Glen*	*Birchip*	*8.8.13*	*E.A.K.*
2398	Gamekeeper	5 years	L. Hill	Horsham	1.7.13	E.A.K.
2515	Gay Gordon	5 years	J. Ferguson	Swan Hill	13.8.13	R.N.J.
2560	General Gordon	5 years	J. Timms, junr.	Lilydale	2.9.13	R.G.
2392	Glen Avon	6 years	P. Anderson	Newmarket (Special)	23.6.13	E.A.K.
2565	Glen Donald	5 years	A. Gibson, junr.	Port Fairy	26.8.13	E.A.K.
2470	Glenmuick	5 years	J. Clark	Yarrawonga	5.8.13	R.G.
2632	Good Enough	5 years	J. Mills	Craigieburn (Special)	12.1.14	R.G.
2456	Hampton Ben	5 years	H. Allen	Beulah	31.7.13	E.A.K.
2597	Heather Lad	5 years	Benson Bros.	Melton	8.9.13	G.H.
2458	Herd King	5 years	J. and P. Stahl	Wycheproof	1.8.13	R.G.
2598	Hiawatha	5 years	A. L. Hamilton	Corryong	10.9.13	R.N.J.
2433	*Highland Chief III.*	6 years	H. S. Ruddock	Newmarket	21.7.13	E.A.K.
2467	His Lordship	5 years	R. Jack and Son	Rutherglen	4.8.13	R.G.

Supplementary List of Life Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			Draughts—*continued.*			
2419	His Majesty	5 years	H. J. Whittingham	City Horse Bazaar	14.7.13	R.G.
2633	His Majesty	5 years	E. J. Rickey	Smeaton	11.9.13	E.A.K.
2428	Jack's the Lad	5 years	J. Bird	City Horse Bazaar	15.7.13	R.N.J.
2542	Kelm Loch	5 years	J. Christie	Castlemaine	18.8.13	R.G.
2580	Kelm's Best	5 years	J. Gooley	Leongatha	1.9.13	R.N.J.
2518	King's Clydesdale	5 years	G. Harders	Dimboola	13.8.13	E.A.K.
2591	Kingston	5 years	Henebery and *Hawkins*	Maffra	4.9.13	E.A.K.
2404	Kingfisher	5 years	R. P. Young	Horsham	1.7.13	R.G.
2568	King of Clubs	6 years	M. Skeyhill	Camperdown	27.8.13	E.A.K.
2556	Kin's Fancy	5 years	W. H. Gibbons	Ouyen	29.8.13	R.N.J.
2570	Latest Fashion	5 years	J. Phalp	Colac	29.8.13	E.A.K.
2423	Leonard	5 years	W. Price-Jones	City Horse Bazaar	15.7.13	R.G.
2595	Loch Allen	5 years	T. Smith	Sth. Yan Yean	8.9.13	R.G.
2491	Lowesby Masterpiece	5 years	C. Bushby	Horsham	2.7.13	R.G.
2579	Lymm Champion II.	5 years	E. Wilson	Leongatha	1.9.13	R.N.J.
2495	Lymm Forest Boy	5 years	G. H. Hill	Horsham	1.7.13	E.A.K.
2393	Lymm Raider	5 years	M. J. Caffrey	Newmarket (Special)	23.6.13	E.A.K
2593	Lord Armadale	6 years	E. Roberts	Scottish Exam.	21.6.13	..
2599	Lord Donald	5 years	A. Harris	Corryong	10.9.13	R.N.J
2646	Lord Dundee	5 years	*J. J. Downey*	*Ballarat*	12.9.13	R.G.
2508	Lord Melbourne	Aged	J. Harry and Sons	Dingee (Special)	12.8.13	R.N.J.
2434	Lord Mitchell	5 years	H. McLaren	Newmarket	22.7.13	E.A.K.
2429	McGregor's Fancy	7 years	Mitchell and O'Brien	City Horse Bazaar	15.7.13	E.A.K.
2490	Mac's Fancy	6 years	G. W. Francis	Horsham	1.7.13	E.A.K.
2581	Major's Pride	5 years	F. J. MacDonald	Leongatha	1.9.13	R.N.J.
2394	Mark	5 years	M. J. Caffrey	Newmarket (Special)	23.6.13	E.A.K.
2412	*Mark Ward*	*5 years*	J. Schinnick	*Numurkah*	9.7.13	R.G.
2437	Marmont	Aged	G. J. Glossop	New Zealand Exam	14.6.13	..
2522	Marshall	5 years	J. Stafford	Geelong	14.8.13	E.A.K.
2471	Martin Zealot	5 years	J. Flanagan	Yarrawonga	5.8.13	R.G
2126	Marton Peacemaker	5 years	W. Danaher	City Horse Bazaar	15.7.13	R.N.J
2585	Mataura	5 years	McGorran Bros.	Morwell	2.9.13	E.A.K.
2427	Medlar Harold	5 years	R. Hart	City Horse Bazaar	15.7.13	R.N.J.
2516	Milburn	5 years	T. Dagge	Swan Hill	13.8.13	R.N.J.
2489	Model Prince	5 years	J. Gifford	St. Arnaud	6.8.13	E.A.K.
2528	Moravian	5 years	H. Boyd	Elmore	15.8.13	R.N.J
2425	Nailstone Jew	5 years	W. Price-Jones	City Horse Bazaar	15.7.13	R.N.J
2530	Neotsfield Rufus	5 years	J. Munro	Agric. Offices	16.8.13	E.A.K.
2420	Newton Moore	5 years	A. L. and E. M. Walter	City Horse Bazaar	14.7.13	R.N.J
2512	*Newton's Best*	5 years	*J. J. McCarron*	*Nathalia*	13.8.13	R.G.
2592	Noble King	5 years	W. A. Hammill	Maffra	4.9.13	E.A.K
2553	Perfection	5 years	N. Ramsay	Inglewood	28.8.13	R.G.
2483	Premier Lauder	5 years	P. Kelleher	Benalla	8.8.13	R.G.
2501	Premier McNab	5 years	J. Burns	Euroa	11.8.13	G.H
2548	Premier Montgomery of Willow Bank	5 years	Undera Syndicate	Shepparton	22.8.13	R.G.
2524	Pride of Fashion	5 years	W. Walter	Geelong	14.8.13	E.A.K.
2435	Pride of the West	5 years	J. R. and H. J. *Manson*	Newmarket	21.7.13	R.G.
2413	Prince Cedric	5 years	J. Jeffrey	Numurkah	9.7.13	R.G.
2618	Prince Imperial	5 years	J. Mansfield	Kyneton	10.10.13	E.A.K.
2421	Prince Robin	6 years	E. W. Fowler	City Horse Bazaar	14.7.13	E.A.K.
2451	Prince Thornley	5 years	C. McFarlane	Hopetoun	29.7.13	E.A.K.
2523	Prince William	6 years	E. J. Fowler	Geelong	14.8.13	E.A.K
2472	Rantin Robin	5 years	J. Clark	Yarrawonga	5.8.13	R.G.
2494	Robin Hood	5 years	J. P. Belleville	Watchem	7.8.13	E.A.K
2436	Robin Hood	5 years	J. C. Whiteman	Newmarket	22.7.13	E.A.K.
2549	Royal Ben	5 years	C. F. Nuske *and Son*	Jeparit	22.8.13	E.A.K.
2575	Royal Fashion	5 years	W. J. Coulter	Mirboo North	1.9.13	E.A.K
2387	Royal Review	5 years	Mitchell and O'Brien	Melbourne (Special)	18.6.13	E.A.K.
2513	Royal Robin	5 years	P. and R. Ferrari	Nathalia	13.8.13	R.G.
2443	Royal Shepherd	5 years	R. Trimble	New Zealand Exam.	16.6.13	..
2631	Royalty	5 years	Roberts Bros.	Daylesford	10.9.13	E.A.K.
2473	Royal Willie	5 years	A. Boyd	Minyip	7.8.13	R.N.J.
2448	Sandy McNab	6 years	E. P. Wall	Quambatook	29.7.13	R.G.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

DRAUGHTS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2493	Scarcliffe Memento	5 years	E. G. Bath	St. Arnaud	6.8.13	E.A.K.
2452	Scottish Lad	5 years	A. Hill	Murtoa	30.7.13	E.A.K.
2624	Scottish Pride	5 years	A. J. Tozer	Wonthaggi	15.10.13	R.G
2595	Shepherd's Pride	5 years	W. Church	Dookie	11.8.13	R.G
2625	Signaller	6 years	H. E. Mapleson	Wonthaggi	15.10.13	R.G
2497	Southern Star	5 years	H. Green	Birchip	8.8.13	E.A.K
2459	Stanley Herd	5 years	M. and T. Smith	Wycheproof	1.8.13	R.G.
2608	Statesman	5 years	N. C. Teychenne	Ballarat	12.9.13	R.G
2447	Sir John Small	5 years	D. Blair	Boort	29.7.13	R.G.
2554	Sir Regulus	5 years	J. B. Howe	Inglewood	28.8.13	R.G.
2388	Sir Thornley's Pride	5 years	Kennedy and Walters	Melbourne (Special)	18.6.13	E.A.K
2422	Sir Walter Ryal Bush	5 years	H. S. Graham	City Horse Bazaar	14.7.13	E.A.K
2546	Sir Walter Scott	5 years	H. Whisson	Kaniva	21.8.13	E.A.K
2385	Topsman	5 years	J. R. McKenzie	New Zealand Exam.	2.4.13	..
2555	The Liberal	5 years	A. Borland	Dunolly	28.8.13	R.G
2477	The Premier	5 years	G. Smith	Wangaratta	7.8.13	R.G.
2485	The Premier	5 years	T. Haley, junr.	Benalla	8.8.13	R.G
2596	The Squatter	5 years	J. H. Cornfoot	Sth. Yan Yean	8.9.13	R.G.
2527	The Success	5 years	J. McDonald and Son	Kerang	14.8.13	R.N.J.
2543	The Thistle	5 years	J. B. Marshall	Nhill	20.8.13	E.A.K.
2614	Umberslade Royal William	5 years	Dept. of Agric., S. Aus.	Melbourne (Special)	19.9.13	R.G.
2408	Union Jack	5 years	G. W. Pickford	Horsham	2.7.13	E.A.K.
2442	Victor's Pride	Aged	C. Schubert	Wodonga (Special)	25.7.13	R.N.J.
2495	Waironga Prince	5 years	W. Blair	Watchem	7.8.13	E.A.K.
2587	Wallace	5 years	D. Aubrey	Traralgon	2.9.13	E.A.K.
2563	Young Admiral	5 years	D. H. James	Terang	25.8.13	E.A.K
2449	Young Coronation	5 years	W. J. Bennett	Quambatook	29.7.13	R.G.
2475	Young Dundonald	5 years	W. Williamson	Myrtleford	6.8.13	R.G.
2558	Young Kilbowie	Aged	H. Perkins	Ouyen	29.8.13	R.N.J.
2517	Young Napoleon	5 years	Wm. Connor	Swan Hill	13.8.13	R.N.J.
2594	Young Timekeeper	5 years	Anderson Bros.	Berwick	5.9.13	R.G

THOROUGHBREDS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2566	Aberdeen	Aged	J. H. Hindhaugh	Camperdown	27.8.13	E.A.K.
2465	*Computation*	5 years	*C. Millthorpe*	*Rutherglen*	4.8.13	R.G.
2620	Cornquist	Aged	J. Gibson	Omeo	8.10.13	R.N.J.
2468	Dhobi	Aged	H. Brown	Yarrawonga	5.8.13	R.G
2381	Double Fortune	6 years	A. L. and E. M. Walter	St. Kilda (Special)	22.4.13	R.N.J.
2469	Glen Hurst	Aged	R. Webster	Yarrawonga	5.8.13	R.G.
2530	Handyman	Aged	A. E. Clarke	Euroa	11.8.13	G.B.
2504	Hortulan	Aged	W. W. Rosser	Yarrawonga	5.8.13	R.G.
2572	Montcalm	Aged	A. S. Lucas	Colac	29.8.13	E.A.K.
2544	Orline	Aged	J. Clark	Echuca	20.8.13	R.G.
2382	Prince Camilo	5 years	J. Widdis	Glenhuntly (Special)	30.4.13	E.A.K.
2474	Quick Merv	Aged	J. Carthew	Myrtleford	6.8.13	R.G.

LIGHT HORSES.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2537	Abby	5 years	Harricks Bros.	Ararat	18.8.13	R.N.J.
2593	Almont's Pride	6 years	J. Downie	Bunyip	5.9.13	E.A.K.
2417	Basil B.	Aged	M. D. Coffey	City Horse Bazaar	14.7.13	E.A.K.
2386	Beaconsfield Flyer	Aged	W. A. Syme	Camberwell (Special)	6.6.13	R.G.
2418	Bill Osterley	Aged	F. Matthews	City Horse Bazaar	14.7.13	R.G.
2389	Caimantine	Aged	A. E. Batson	Buckley (Special)	20.6.13	R.G.
2576	Carbinet	Aged	W. Falls	Foster	1.9.13	R.N.J.
2479	Clareaco	Aged	C. Lee	Benalla	8.8.13	R.G.
2538	Costrel	Aged	Mrs. H. Turner	Ararat	18.8.13	R.N.J.
2414	Despatch	..	W. E. Rosling	New South Wales Exam.	30.9.10	..
2559	Direction	5 years	R. R. Corbould	Mildura	28.8.13	R.N.J.
2525	Direct Speed	5 years	E. Pay	Kerang	14.8.13	R.N.J.
2582	Donald	5 years	Bonny Bros.	Lang Lang	2.9.13	R.N.J.
2488	Echo	5 years	E. G. Bath	St. Arnaud	6.8.13	E.A.K

Supplementary List of Life Certificated Stallions—*continued.*

Light Horses—continued.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2541	Fakreddin..	5 years	S. Winter-Cooke	Hamilton	19.8.13	R.N.J.
2440	First Voyage	5 years	Belmont Stud Farm	Agric. Offices	26.7.13	E.A.K.
2578	Gay Bells	5 years	J. D. Symons	Leongatha	1.9.13	R.N.J.
2455	*Goldfisher*	*Aged*	*J. Walsgott*	*Beulah*	*31.7.13*	E.A.K.
2507	Harold Direct	5 years	T. Larkins	Pyramid	11.8.13	R.N.J.
2383	Harviestoun Matador	6 years	J. R. Mackenzie	New Zealand Exam.	2.4.13	..
2441	Height of Fashion	6 years	W. E. Rosling	Agric. Offices	26.7.13	E.A.K.
2457	*Huon King*	*Aged*	*A. Collins*	*Beulah*	*31.7.13*	E.A.K.
2611	John Wren	5 years	J. B. Zander	Royal Show	22.9.13	E.A.K.
2623	Jubit	Aged	H. Spencer	Benambra (Special)	9.10.13	R.N.J.
2590	Judge Byron	Aged	E. F. Blyth	Maffra	4.9.13	E.A.K.
2526	King Owyhee	5 years	M. Troy	Kerang	14.8.13	R.N.J.
2621	Little Coy..	Aged	P. McCoy	Omeo	8.10.13	R.N.J.
2511	Little Jack	6 years	K. Campbell	Nathalia	13.8.13	R.G.
2571	*Lord of Lincoln*	*5 years*	*G. Trigg*	*Colac*	*29.8.13*	E.A.K.
2584	Lord Osterley	Aged	F. Grasshan	Morwell	2.9.13	E.A.K.
2604	Nyparuu II.	5 years	R. W. Hannon	Bacchus Marsh	11.9.13	R.G.
2607	Oaklands ..	5 years	A. Porteous	Ballarat	12.9.13	R.G.
2631	Odd Patch	5 years	G. H. Finlay	Nyora (Special)	15.12.13	Appeal Board
2557	Patch Boy	5 years	M. McIntyre	Ouyen	29.8.13	R.N.J.
2609	Perfection	5 years	E. Baker	Tatura	21.8.13	R.G.
2450	Prince Harold	5 years	C. Darley	Hopetoun	29.7.13	E.A.K.
2484	Prince Harold Boy	Aged	C. and T. Walters	Benalla	8.8.13	R.G.
2532	*Riot*	*6 years*	*W. C. Bayley*	*Hamilton*	*19.8.13*	R.N.J.
2613	Royal Sovereign	5 years	C. Ridley	Royal Show	20.9.13	E.A.K.
2586	Silver Bells	5 years	A. G. McClements	Traralgon	2.9.13	E.A.K.
2460	Sir Carlaw	5 years	J. Bunge	Warracknabeal	1.8.13	E.A.K.
2622	Sir Quist ..	6 years	F. W. Hutton	Omeo	8.10.13	R.N.J.
2602	Swimming Belt	Aged	Roberts Bros.	Daylesford	10.9.13	E.A.K.
2529	Toke Bells	5 years	R. Trewick	Cobram	15.8.13	R.G.
2533	*Toy Bells* ..	*6 years*	*C. Nolte*	*Hamilton*	*19.8.13*	R.N.J.
2627	Turo	Aged	A. Cadee	Wonthaggi	15.10.13	R.G.
2629	Viking	Aged	A. G. Turnbull	Hamilton (Special)	28.10.13	Appeal Board
2551	Yaapeet	5 years	J. Fisher	Rainbow	26.8.13	R.G.
2540	*Y. Z.*	*6 years*	*A. C. Ross*	*Casterton*	*20.8.13*	R.N.J.
2498	Young Harold	6 years	E. Wyatt	Birchip	8.8.13	E.A.K.

PONIES.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
2463	Advance ..	5 years	L. Harper	Rutherglen	4.8.13	R.G.
2619	Bally Hooley	Aged	W. E. Rosling	Agric. Offices	11.10.13	R.G.
2574	Bobby Burns Junior	Aged	P. Uren..	Werribee	30.8.13	E.A.K.
2567	Bobs	5 years	W. H. Podger	Camperdown	27.8.13	E.A.K.
2610	Emulance	5 years	P. Cannon	Royal Show	20.9.13	E.A.K.
2539	Heather King	6 years	M. W. Dwyer	Casterton	20.8.13	R.N.J.
2415	I Am Coming	5 years	W. E. Rosling	Agric. Offices	12.7.13	E.A.K.
2521	Leroy II. ..	5 years	A. Warren	Geelong	14.8.13	E.A.K.
2482	Little King	5 years	R. H. Chivers	Benalla	8.8.13	R.G.
2481	Little Wonder 2nd ..	5 years	H. Burness	Benalla	8.8.13	R.G.
2502	*Llewellyn II.*	*5 years*	*J. Hall* ..	*Seymour*	*12.8.13*	G.H.
2534	Lord Lonsdale	5 years	Wm. Cole	Coleraine	20.8.13	R.N.J.
2600	Paddy	Aged	T. Murrell	Corryong	10.9.13	R.N.J.
2535	Prince Hal	Aged	Jno. Hardy	Coleraine	20.8.13	R.N.J.
2612	Prince Leo 3rd	5 years	L. Hordern	Royal Show	22.9.13	E.A.K.
2439	Robin Bundoora	*Aged*	*J. Gray*	*Bendigo*	*24.7.13*	E.A.K.
2416	Starlight ..	5 years	D. G. Black	Agric. Offices	12.7.13	R.G.
2589	Starlight ..	6 years	J. M. Brown	Korumburra	3.9.13	R.N.J.
2536	Taffy	Aged	J. G. Laidlaw	Coleraine	20.8.13	R.N.J.
2626	The Drummer Boy	Aged	J. Richards	Wonthaggi	15.10.13	R.G.
2577	Tich	Aged	R. B. Stamp	Foster	1.9.13	R.N.J.
2478	Venture ..	Aged	H. F. Hoysted	Wangaratta	7.8.13	R.G.
2615	*Victor*	*Aged*	*T. O'Connor*	*Romsey*..	*1.10.13*	R.G.
2617	Wee MacGregor	5 years	J. Hammill	Orbost ..	7.10.13	R.G.
2410	What's This Coming	5 years	W. E. Rosling	Agric. Offices	5.7.13	R.G.
2552	Young Brigham	6 years	R. W. Nichol	Clunes ..	29.8.13	R.G.
2628	Young Nobby	6 years	L. Durling	Wonthaggi	15.10.13	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

(Four-year-old Certificates expiring 30th June, 1914.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS.			
732/4	Abbotsford King	Aust. Mort. L. and F. Co.	New Zealand Exam.	27.5.13	.
740/4	Abbotsford Prince	Goldsbrough, Mort.	New Zealand Exam.	27.5.13	.
800/4	*Abbot's Pride*	S. Winter-Cooke	*Hamilton*	*19.8.13*	R.N.J.
749/4	Admiral Grampian	T. W. Nolan	Wycheproof	1.8.13	R.G.
844/4	Admiral Howard	R. W. Herkes	Dandenong	5.9.13	R.G.
692/4	Admiral Nelson	J. Jeffrey	Numurkah	9.7.13	R.G.
721/4	Advocate	H. F. C. Keats	City Horse Bazaar	17.7.13	E.A.K.
783/4	Agitator's Heir	J. Langford	Kerang	14.8.13	R.N.J.
809/4	Aird Laddie	A. J. Yeaman	Rochester	19.8.13	R.G.
695/4	Argyle	J. Adams	City Horse Bazaar	14.7.13	R.N.J.
689/4	Armadale Gay Erskine	Ryder Bros.	New Zealand Exam.	30.5.13	..
769/4	Atlas	R. C. Hannah	Donald	6.8.13	E.A.K.
661/4	Auctioneer	A. Alison	Newmarket (Special)	23.6.13	R.G.
723/4	Baron Barnton	A. Watson, jun.	Newmarket	21.7.13	R.N.J.
746/4	Baron Black	G. Young	Murton	30.7.13	E.A.K.
824/4	Baron Brilliant	J. Archibald	Kyabram	21.8.13	R.G.
659/4	Baron Daimler	M. J. Caffrey	Newmarket (Special)	23.6.13	R.G.
767/4	Baron Laddie	A. McLennan	Heathcote	4.8.13	E.A.K.
772/4	Baron Lough	Gerrard Bros.	Seymour	12.8.13	G.H.
828/4	Baron Watson	W. T. Manifold	Camperdown	27.8.13	E.A.K.
679/4	Bold Charmer	T. Sherwood	Horsham	1.7.13	E.A.K.
662/4	Bonnie McFarlane	A. Robertson	Newmarket	23.6.13	R.G.
770/4	Boro Jameson II.	Reilly Bros.	Donald	6.8.13	E.A.K.
686/4	Boro Ranger	W. T. Bodey	Horsham	2.7.13	E.A.K.
665/4	Boro Rising Star	G. Burrows	English Exam.	17.2.13	.
696/4	Bosun	G. and W. Lord	City Horse Bazaar	14.7.13	R.N.J.
860/4	Bothwell	A. E. Godden	Kyneton	10.10.13	E.A.K.
716/4	Breadalbane	Mitchell and O'Brien	City Horse Bazaar	15.7.13	R.N.J
754/4	Britain	C. Taylor	Rutherglen	4.8.13	R.G.
818/4	Briton Again	G. L. Claxton	Tatura	21.8.13	R.G.
753/4	Briton's Pride	A. Cameron	Edenhope	31.7.13	R.N.J.
872/4	Brookdale	J. T. Poynton	Ensay (Special)	7.10.13	R.N.J
826/4	Carbineer	J. C. Rockliffe	City Horse Bazaar	18.6.13	E.A.K.
739/4	Chief Officer	H. S. Graham	New Zealand Exam.	17.6.13	..
782/4	Cock of the North	Burge Bros.	Rushworth	14.8.13	R.G.
801/4	Coree	Jackson and Sons	Hamilton	19.8.13	R.N.J.
787/4	Coronation	O'Donnell Bros.	Dookie	11.8.13	R.G.
747/4	Coronation	C. Marshman	Beulah	31.7.13	E.A.K.
675/4	Count Everest	W. Langley	Horsham	1.7.13	E.A.K
822/4	Cremoran's Pride	W. Henneberg	Rainbow	26.8.13	R.G.
841/4	Dalmuir Rob	W. and L. Semmens	Maffra	4.9.13	E.A.K.
855/4	Daring Foe	Gange Bros.	Royal Show	22.9.13	R.G.
738/4	Doctor Findlay	A. L. and E. M. Walter	New Zealand Exam.	16.6.13	..
687/4	Don McDonald	E. Koenig	Horsham	2.7.13	E.A.K.
874/4	Donald Mac	W. J. Craig	Wonthaggi	15.10.13	R.G.
669/4	Drysdale	E. Roberts	Scottish Exam.	3.3.13	..
717/4	Dunchurch Boy	W. Price-Jones	City Horse Bazaar	15.7.13	R.N.J.
724/4	Duncraig Again	A. Dunning	Newmarket	21.7.13	E.A.K.
757/4	Dundonald's Chief	H. Doherty	Tungamah	5.8.13	R.G.
698/4	Dunedin	R. and J. Dickeson	City Horse Bazaar	14.7.13	R.G.
789/4	Dun Lea	A. McKinnon	Pyramid	11.8.13	R.N.J.
784/4	Dunrobin's Pride	T. Sutherland	Kerang	14.8.13	R.N.J.
766/4	Dunsmore's Pride	T. A. Griffith	Benalla	8.8.13	R.G.
690/4	Durbar	J. M. Phillips	City Horse Bazaar	14.7.13	E.A.K.
712/4	Eaton Combination	F. Gerdts	City Horse Bazaar	15.7.13	R.G.
811/4	Eaton Ensign	W. Hicks	Nhill	20.8.13	E.A.K.
751/4	Federation's Pride	F. R. Burns	Goroke	30.7.13	R.N.J.
658/4	*First Favourite*	*Mitchell and O'Brien*	*City Horse Bazaar*	18.6.13	E.A.K.
879/4	Flowerdale	E. Roberts	Scottish Exam.	18.8.13	..
865/4	Flowerdale Prince	A. R. Wilson	Romsey	1.10.13	R.G.
700/4	Garthland Again	Brady Bros.	City Horse Bazaar	14.7.13	E.A.K.
771/4	Gay City	Middleton and Phillips	Watchem	7.8.13	E.A.K.
775/4	Gay Gordon	A. W. Warren	Geelong	14.8.13	E.A.K.
798/4	General McDonald	J. Vickers	Elmore	15.8.13	R.N.J.
663/4	General Stewart	A. Robertson	Newmarket	23.6.13	E.A.K.
875/4	Glenallan	A. J. Tozer	Wonthaggi	15.10.13	R.G.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
			Draughts—*continued.*		
693/4	Glen Gairn	J. MacGregor	Numurkah	9.7.13	R.G.
870/4	Glenmarkie	D. McRae	Kyneton	10.10.13	E.A.K.
720/4	Glenryan	W. Hill	City Horse Bazaar	17.7.13	R.G.
856/4	Gowan Brae	R. I. Argyle	Royal Show	20.9.13	R.N.J.
670/4	Granvalier	J. E. Small	Agricultural Offices	28.6.13	E.A.K.
725/4	Harry Lauder	L. W. Andrews	Newmarket	21.7.13	R.G.
750/4	Hector Dillon	K. Cameron	Warracknabeal	1.8.13	E.A.K.
702/4	Hero	Cain Bros.	Nathalia	13.8.13	R.G.
785/4	Hero's Pride	W. Dowling	Kerang	14.8.13	R.N.J.
676/4	Highland Chief	Noske Bros.	Horsham	1.7.13	E.A.K.
688/4	Hindmaster	W. E. Spehr	New Zealand Exam.	9.5.13	..
657/4	Jack Shepherd	Kennedy and Walter	City Horse Bazaar	18.6.13	E.A.K.
773/4	John O'Groat	E. Roberts	Scottish Exam.	23.6.13	..
854/4	Karamu Glen Markie	M. McCormack	Mansfield (Special)	7.9.13	G.H.
677/4	Kinclyde	W. T. Bodey	Horsham	1.7.13	R.G.
834/4	King's Own	J. Denham	Mirboo North	1.9.13	E.A.K.
781/4	Laird O'Gowrie	J. Harper	Murchison	14.8.13	R.G.
867/4	Laird of Lochiel	O'Neill Bros.	Orbost	7.10.13	R.G.
736/4	Lawrence	Mitchell and O'Brien	City Horse Bazaar (Special)	18.6.13	R.G.
788/4	Legislator	W. H. Ludemann	Dookie	11.8.13	R.G.
694/4	Long Lawford Chief	J. King	Quambatook	29.7.13	R.G.
793/4	Lookout	J. Conly	Nathalia	13.8.13	R.G.
852/4	Lucky Charm	D. Williamson	Ballarat	12.9.13	R.G.
669/4	Lymm Prime Minister	M. J. Caffrey	Newmarket (Special	23.6.13	E.A.K.
760/4	Lord Albyn	R. Sweetman	Minyip	7.8.13	R.N.J.
714/4	Lord Chancellor	Dean Bros.	City Horse Bazaar	15.7.13	E.A.K.
733/4	Lord Hamilton	J. Adams	New Zealand Exam.	27.5.13	..
719/4	Lord Hogan	E. J. Rickey	City Horse Bazaar	16.7.13	E.A.K.
845/4	Lord Nelson	E. J. Brown	Corryong	10.9.13	R.N.J.
831/4	Lord Plunton	J. James	Colac	29.8.13	E.A.K.
848/4	Lord Ronald	E. J. Rickey	Smeaton	11.9.13	E.A.K.
803/4	Lord Shepherd	Noske Bros.	Hamilton	19.8.13	R.N.J.
702/4	McGregor Again	J. Archibald	City Horse Bazaar	14.7.13	E.A.K.
690/4	Mack's Pride	R. N. Herkes	Clyde (Special)	9.7.13	E.A.K.
681/4	Mac's Tartan	A. McLennan	Horsham	2.7.13	R.G.
713/4	Majestic	J. Adams	City Horse Bazaar	15.7.13	E.A.K.
878/4	Major Dale	J. R. McKenzie	Scottish Exam.	18.8.13	..
737/4	Major Oates	Central Research Farm, Werribee	City Horse Bazaar	18.6.13	R.G.
836/4	Major's Best	Stuckey Bros.	Traralgon	2.9.13	E.A.K.
726/4	Marshall Mills	Graham Bros.	Newmarket	21.7.13	E.A.K.
722/4	Model Mills	E. J. W. Bail	Melbourne (Special)	15.7.13	R.N.J.
678/4	Moira Everlasting	J. H. Hall	Horsham	1.7.13	R.G.
832/4	Mount Everest	J. A. McKenzie	Werribee	30.8.13	E.A.K.
808/4	Muntham Lad	W. A. McDonald	Coleraine	19.8.13	R.N.J.
774/4	Newton Lad	P. Rogers	Dimboola	13.8.13	E.A.K.
764/4	Newton's Best	W. H. Bell	Wangaratta	7.8.13	R.G.
819/4	Onward O	Exors. late R. Currie	Shepparton	22.8.13	R.G.
673/4	Pioneer	Mitchell and O'Brien	Horsham	1.7.13	R.G.
671/4	Premier Carmichael	Paterson Bros.	Romsey (Special)	24.6.13	G.H.
727/4	Premier McPherson	D. McClure	Newmarket	22.7.13	R.N.J.
691/4	Premier Massey	J. Blair	Newmarket	23.6.13	E.A.K.
761/4	Premier Prince	McDonald and Sons	Minyip	7.8.13	R.N.J.
703/4	Pride of Gladstone	A. Watson	City Horse Bazaar	14.7.13	R.N.J.
837/4	Prince	P. O'Callaghan	Yarram	4.9.13	R.N.J.
728/4	Prince	A. McDonald	Newmarket	21.7.13	R.N.J.
704/4	Prince Darnley	J. Young	City Horse Bazaar	14.7.13	R.N.J.
758/4	Prince Herd	J. Colvin	Tungamah	5.8.13	R.G.
652/4	Prince Sandy	Mitchell and O'Brien	City Horse Bazaar	18.6.13	E.A.K.
786/4	Prince William	W. R. Berger	Benalla	8.8.13	R.G.
668/4	Quarrington Chatsworth	L. B. Oppenheim	English Exam.	19.4.13	..
667/4	Quarrington Royal Albert	R. Carroll	English Exam.	19.4.13	..
653/4	Recruit	Mitchell and O'Brien	City Horse Bazaar	18.6.13	E.A.K.
812/4	Repeater	E. H. Rethus	Nhill	20.8.13	E.A.K.
705/4	Riverside	J. Adams	City Horse Bazaar	14.7.13	R.N.J.
838/4	Roseneath King	J. Jamieson	Yarram	4.9.13	R.N.J.
752/4	Ruby's Pride	W. G. Burns	Goroke	30.7.13	R.N.J.
763/4	Runnymede	F. W. Grigg	Myrtleford	6.8.13	R.G.
706/4	Royal Charlie	Warbreccan Pastoral Co.	City Horse Bazaar	14.7.13	R.G.
820/4	Royal Churchill	H. Wright	Shepparton	22.8.13	R.G.
862/4	Royal Clifton	H. Gilmore	Royal Show	22.9.13	E.A.K.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS—*continued.*			
863/4	Royal Escort	Capt. J. A. Stewart-Balmain	Royal Show	20.9.13	R.G.
827/4	Royal Gartley	S. Knight	Terang	25.8.13	E.A.K.
790/4	Royal Gem	R. J. Wakeham	Pyramid	11.8.13	R.N.J.
685/4	Royal Link	F. W. Gerdtz	Horsham	2.7.13	R.G.
807/4	Royal Main	Stock Bros.	Casterton	20.8.13	R.N.J.
864/4	Royal Salute	T. Opie	Royal Show	20.9.13	R.N.J.
780/4	Royal Saxon	A. J. Walters	Bendigo	14.8.13	G.H.
707/4	Royal Standard	H. S. Graham	City Horse Bazaar	14.7.13	E.A.K.
756/4	Royal Stewart	Dean Bros.	Euroa	11.8.13	G.H.
846/4	Scotchman	W. Strawhorn and Son	Daylesford	10.9.13	E.A.K.
741/4	Scotch Thistle	Wm. Haw	Boort	29.7.13	R.G.
651/4	Scotland's Pride	S. Coombs	Glenroy Special	22.5.13	R.G.
821/4	Scotland Yet	W. Gardner	Yea	26.8.13	R.N.J.
847/4	Shamrock	J. Frith	Daylesford	10.9.13	E.A.K.
794/4	Shepherd's Pride	P. A. Ferrari	Nathalia	13.8.13	R.G.
805/4	Shepherd's Pride	J. Mibus and Son	Hamilton	19.8.13	R.N.J.
680/4	Shepherd Yet	O. Maroske	Horsham	2.7.13	R.G.
682/4	Shopnoller Ploughman	W. Price Jones	Horsham	2.7.13	E.A.K.
654/4	Signalman	D. McGrath	City Horse Bazaar	18.6.13	E.A.K.
729/4	Silver Style	H. Gibson	Newmarket	21.7.13	E.A.K.
795/4	Statesman	J. Crane	Nathalia	13.8.13	R.G.
655/4	Supremacy	Mitchell and O'Brien	City Horse Bazaar	18.6.13	R.G.
708/4	Sir Daniel	E. J. Glossop	City Horse Bazaar	14.7.13	R.N.J.
664/4	Sir David	A. Robertson	Newmarket	23.6.13	R.G.
768/4	Sir Wilfred	A. J. Mackay	St. Arnaud	6.8.13	E.A.K.
709/4	Taieri Chief	J. Buckley	City Horse Bazaar	14.7.13	R.G.
742/4	Tam McGregor	T. Walker	Boort	29.7.13	R.G.
718/4	Tarnacre Town	W. Price-Jones	City Horse Bazaar	15.7.13	R.N.J.
833/4	Titch	A. Gillis	Werribee	30.8.13	E.A.K
791/4	Titiroa Baron	Herkes Bros.	Pyramid	11.8.13	R.N.J.
715/4	True Blue	E. Fitzgerald	City Horse Bazaar	15.7.13	E.A.K
765/4	Tweedbank	D. Gardiner	Wangaratta	7.8.13	R.G.
730/4	Twilight	R. N. Scott	Newmarket	22.7.13	E.A.K
842/4	The Baron	J. R. Glenn	Maffra	4.9.13	E.A.K.
839/4	The Knight	E. R. Morton	Warragul	4.9.13	R.G.
..	The Laird	C. Falkenberg	Colac	29.8.13	E.A.K.
734/4	The Premier	A. Borland	Bendigo	24.7.13	E.A.K.
656/4	The Ranter	D. L. Doolette	City Horse Bazaar	18.6.13	E.A.K.
796/4	The Stewart	A. Colvin	Nathalia	13.8.13	R.G.
731/4	Ulimaroa	F. Jones	Newmarket	21.7.13	R.N.J.
684/4	Umberslade Friar	W. Price-Jones	Horsham	2.7.13	E.A.K.
683/4	Umberslade Senator	R. A. Smales	Horsham	2.7.13	E.A.K
825/4	Wee MacGregor	W. Nattrass	Ouyen	29.8.13	R.N.J
843/4	Wigtonshire	Burton Bros.	Maffra	4.9.13	E.A.K.
666/4	Workmaster	G. W. Burrows	English Exam.	19.4.13	..
710/4	Young Clyde	J. Harkins	City Horse Bazaar	14.7.13	R.N.J.
823/4	Young Crown	Wyatt Bros.	Rainbow	26.8.13	R.G.
748/4	Young General McLellan	H. Naylor	Beulah	31.7.13	E.A.K.
871/4	Young Lord Lyon	W. and G. Main	Kyneton	10.10.13	E.A.K.
711/4	Young Prince	G. Burrows	City Horse Bazaar	14.7.13	R.N.J
814/4	Young Sir David	L. R. Simon	Nhill	20.8.13	E.A.K.
		LIGHTS.			
762/4	All Kilts	R. E. Sinclair	Myrtleford	6.8.13	R.G.
850/4	Auburn Prince	S. McCartney	Ballarat	12.9.13	R.G.
877/4	Boldrewind	A. Simpson	Agricultural Offices	22.11.13	E.A.K.
672/4	Commonwealth	S. Matheson	Horsham	1.7.13	R.G.
851/4	Cosmo	H. V. Ireland	Ballarat	12.9.13	R.G.
697/4	Dispatch	M. D. Coffey	City Horse Bazaar	14.7.13	E.A.K.
815/4	Don Marvin	L. Taylor	Echuca	20.8.13	R.G.
776/4	Gentleman George	G. F. Cork	Geelong	14.8.13	E.A.K.
778/4	Harkaway	B. O'Connor	Bendigo	14.8.13	G.H.
745/4	Harry Almont	J. Douglas, jun.	Charlton	30.7.13	R.G.
759/4	Honest Cleve	O. Vince	Minyip	7.8.13	R.N.J.
779/4	Honesty	J. O'Sullivan	Bendigo	14.8.13	G.H.
816/4	Jock Direct	W. Tainsch	Echuca	20.8.13	R.G.
743/4	Killarney	J. Binns	Hopetoun	29.7.13	E.A.K.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		Lights—*continued.*			
817/4	Merry Peel	D. McLeod	Kyabram	21.8.13	R.G.
804/4	Pirateer	H. Menzel	Hamilton	19.8.13	R.N.J.
866/4	Rock Bells	J. Sheehan	Romsey	1.10.13	R.G.
873/4	Sam J.	N. Jones	Werribee (Special)	20.10.13	E.A.K.
777/4	Titanic	W. Day	Geelong	14.8.13	E.A.K.
802/4	Tulchan Gem	D. Crosbie	Ouyen	29.8.13	R.N.J.
813/4	Ven Error	T. McPhee	Nhill	20.8.13	E.A.K.
840/4	Waterloo II.	J. Ellis	Warragul	4.9.13	R.G.
810/4	Young Clarionet	J. Mitchell	Rochester	19.8.13	R.G.
		Ponies.			
674/4	Clarendon	W. R. Smith	Horsham	2.7.13	E.A.K.
849/4	Claymore	J. P. Hanrahan	Ballan	12.9.13	E.A.K.
735/4	Currie B.	W. J. Bunting	Agricultural Offices	26.7.13	E.A.K.
853/4	Dandelion	Huon Bros.	Tallangatta	15.9.13	R.N.J.
835/4	Dandy Lad	Stuckey Bros.	Traralgon	2.9.13	E.A.K.
755/4	Every Time	R. Crozier	Agricultural Offices	9.8.13	G.H.
857/4	Halloo Ragtime	W. Price-Jones	Royal Show	22.9.13	R.N.J.
701/4	Hauteur	R. V. Kelly	City Horse Bazaar	14.7.13	E.A.K.
806/4	Ironbark	J. Price	Portland	21.8.13	R.N.J.
744/4	King Bee	W. T. McAlpine	Hopetoun	29.7.13	E.A.K.
830/4	Latest Model	R. R. McGhie	Warrnambool	28.8.13	E.A.K.
858/4	Leo Prince	H. Suthmier	Royal Show	22.9.13	E.A.K.
859/4	Lochtyn	P. Landale	Royal Show	22.9.13	E.A.K.
860/4	Merriment	W. Price-Jones	Royal Show	22.9.13	E.A.K.
861/4	Robin Hood	R. F. Watson	Royal Show	22.9.13	E.A.K.
829/4	Silverton	D. McDonald	Camperdown	27.8.13	E.A.K.
797/4	Warrack	Discaciati and Warburton	Swan Hill	13.8.13	R.N.J.
868/4	Wee Laddie	R. Perry	Orbost	7.10.13	R.G.
876/4	Young Valley	W. Milnes	Wonthaggi	15.10.13	R.G.
		(Three-year-old Certificates expiring 30th June, 1914.)			
		Draughts.			
1399/3	Advance	S. Smith	Warrnambool	28.8.13	E.A.K.
1384/3	Albert Onward	T. Coldwell	Shepparton	22.8.13	R.G.
1195/3	Alexander	Mitchell and O'Brien	City Horse Bazaar	18.6.13	E.A.K.
1344/3	Allan Doone	Mitchell and O'Brien	Agricultural Offices	2.8.13	R.G.
1247/3	Argyle	R. McKenzie	Horsham	1.7.13	E.A.K.
1302/3	Armadale	F. Bauer	New Zealand Exam.	30.5.13	..
1194/3	Balmoral	Mitchell and O'Brien	City Horse Bazaar	18.6.13	R.G.
1283/3	Baron	N. McDonald	Newmarket	21.7.13	R.N.J.
1188/3	Baron Abbot	O. A. Moll	Agricultural Offices (Special)	3.5.13	E.A.K.
1303/3	Baron Baxter	J. Adams	New Zealand Exam.	19.4.13	..
1241/3	Baron Bold	D. McDonald and Sons	Horsham	1.7.13	R.G.
1264/3	Baron Briton	L. D. Rathjen	City Horse Bazaar	15.7.13	R.G.
1193/3	Baron Clutha	Mitchell and O'Brien	City Horse Bazaar	18.6.13	R.G.
1258/3	Baron Grand	G. and W. Lord	City Horse Bazaar	14.7.13	R.N.J.
1259/3	Baron Hope	G. and W. Lord	City Horse Bazaar	14.7.13	R.N.J.
1239/3	Baron McKie	Paterson Bros.	Romsey (Special)	24.6.13	G.H.
1214/3	Baron Patrick	A. Robertson	New Zealand Exam.	15.5.13	..
1234/3	Baron Stanley	A. Davison	Agricultural Offices	28.6.13	R.N.J.
1371/3	Bay Rock	A. Mitchell	Casterton	29.8.13	R.N.J.
1337/3	Bay Shanter	M. Kinnane	Charlton	30.7.13	R.G.
1338/3	Ben Lomond	McGilvery Bros.	Charlton	30.7.13	R.G.
1240/3	Ben Shepherd	P. Plozza	Horsham	1.7.13	R.G.
1252/3	Black Baron	J. D. Mitchell	New Zealand Exam.	12.6.13	..
1221/3	Black Shepherd	A. Robertson	Newmarket	23.6.13	R.G.
1284/3	Bold Herod	A. McDonald	Newmarket	21.7.13	E.A.K.
1377/3	Bonnie Times	J. Eyles	Kyabram	21.8.13	R.G.
1222/3	Boro' Major	G. W. Burrows	Newmarket	23.6.13	R.G.
1180/3	Braw Willie	Mitchell and O'Brien	City Horse Bazaar	18.6.13	R.G.
1373/3	Brown Rock	D. G. Tomkins	Coleraine	20.8.13	R.N.J.
1334/3	Cairnbrogie	E. Grieves	New Zealand Exam.	13.6.13	..
1200/3	Caledonia	Mitchell and O'Brien	City Horse Bazaar	18.6.13	R.G.
1341/3	Captain Scott	C. E. Umbers	Sea Lake	31.7.13	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS—*continued.*			
1285/3	Cecil Ward	M. J. Hocking ..	Newmarket	22.7.13	E.A.K.
1242/3	Cedric	K. Cameron ..	Horsham	1.7.13	R.G.
1391/3	Charlie Mills	F. J. Chapman ..	Rainbow	28.8.13	R.G
1275/3	Christmas Morning ..	W. Smith ..	New Zealand Exam. ..	12.6.13	..
1248/3	Clydebank	Noske Bros. ..	Horsham	1.7.13	E.A.K
1410/3	Cock Robin	Clyne Bros. ..	Maffra	4.9.13	E.A.K.
1198/3	Come Again	Mitchell and O'Brien	City Horse Bazaar ..	18.6.13	R.G.
1390/3	Commander Yet ..	W. A. Creighton ..	Alexandra	25.8.13	R.N.J.
1335/3	Convincer	Dyke Bros. ..	New Zealand Exam. ..	13.6.13	..
1286/3	Craigmore	W. R. Smith ..	Newmarket	22.7.13	E.A.K.
1380/3	Crown Prince ..	W. Stewart ..	Tatura	21.8.13	R.G.
1215/3	Donald Stewart ..	M. J. Caffrey ..	Newmarket	23.6.13	R.G.
1223/3	Drummond King ..	E. Grieves ..	Newmarket	23.6.13	E.A.K.
1333/3	Duncarn Prince ..	R. Trimble ..	New Zealand Exam. ..	13.6.13	..
1224/3	*Dunsmore Nigger* ..	*J. Henry*	*Newmarket*	*23.6.13*	*R.G.*
1235/3	Enver Bey	Mitchell and O'Brien	Agricultural Offices ..	28.6.13	E.A.K.
1287/3	Erskine Hero	F. Howell ..	Newmarket	21.7.13	R.N.J
1432/3	Farmer Boy	J. T. Bransgrove ..	Agricultural Offices ..	1.11.13	R.G.
1251/3	Farmer's Fancy ..	J. Bodey and Sons	Horsham	2.7.13	E.A.K
1225/3	Farmer's Pride ..	A. Robertson ..	Newmarket	23.6.13	R.G.
1260/3	Fashion Plate	A. L. and E. M. Walter	City Horse Bazaar ..	14.7.13	R.N.J.
1358/3	Fashion's Pride ..	A. D. McLarty ..	Swan Hill	13.8.13	R.N.J
1212/3	Federal Clansman ..	J. T. Bell ..	Yarra Glen (Special) ..	19.6.13	R.G.
1352/3	Federal Fancy ..	Hyslop and Adair ..	Heathcote	4.8.13	E.A.K.
1288/3	Federal Laddie ..	W. Widdis ..	Newmarket	21.7.13	E.A.K.
1261/3	Federal Mac	A. Austin ..	City Horse Bazaar ..	14.7.13	R.N.J.
1289/3	Federal Tax	H. Jackman ..	Newmarket	21.7.13	R.N.J.
1290/3	Forward	F. Howell ..	Newmarket	21.7.13	R.N.J.
1226/3	Fyvie's Best	A. Robertson ..	Newmarket	23.6.13	E.A.K.
1197/3	Garthland Chief ..	J. E. Small ..	City Horse Bazaar ..	18.6.13	E.A.K.
1332/3	Gay Garthland.. ..	J. R. MacKenzie ..	New Zealand Exam. ..	13.6.13	..
..	Gallant Newton ..	F. W. Lewis ..	South Australian Exam.	7.7.13	..
1406/3	Glen	S. Smethurst ..	Lang Lang	2.9.13	R.N.J.
1372/3	Glenbarr ..	MacDougall Bros. ..	Ararat	18.8.13	R.N.J.
1278/3	Glen Stewart	G. Allardice ..	City Horse Bazaar ..	15.7.13	E.A.K.
1423/3	Golden Crown	H. Gilmore ..	Royal Show ..	22.9.13	R.N.J.
1397/3	Grampian Star ..	D. McDonald ..	Camperdown ..	27.8.13	E.A.K.
1356/3	Hamilton's Pride ..	King Bros. ..	Birchip	8.8.13	E.A.K.
1361/3	Hawthorn	Feery Bros. ..	Dimboola	13.8.13	E.A.K.
1331/3	Heatherlea	E. Grieve	New Zealand Exam. ..	13.6.13	..
1254/3	Heather Lock	R. Tucker.. ..	Horsham	2.7.13	R.G.
[illegible]	Hero's Fashion ..	M. J. Caffrey ..	Newmarket	23.6.13	R.G.
1281/3	Herod's Boy	E. J. Beer ..	City Horse Bazaar ..	15.7.13	R.N.J.
1388/3	Home Rule	C. J. Nuske ..	Jeparit	22.8.13	E.A.K.
1217/3	Hopetoun	*F. W. Unger* ..	*Newmarket*	*23.6.13*	*R.G.*
1196/3	Imperial Knight ..	Mitchell and O'Brien	City Horse Bazaar ..	18.6.13	R.G.
1365/3	Improvement	E. Cassidy ..	Murchison	14.8.13	R.G.
1250/3	Ivanhoe	Bodey Bros. ..	Horsham	2.7.13	R.G.
1262/3	Ivyholm	Westblade Bros. ..	City Horse Bazaar ..	14.7.13	E.A.K.
1421/3	Janitor	H. P. Harrison ..	Melbourne (Special) ..	19.9.13	R.G.
1363/3	Kaffir King	P. Glasheen ..	Bendigo	14.8.13	G.H.
1263/3	Khartoum	E. Currie	City Horse Bazaar ..	14.7.13	R.N.J.
1189/3	Kilmarnock	J. W. Blair ..	New Zealand Exam. ..	3.4.13	..
1292/3	King's Pride	S. H. Wilson ..	Newmarket	21.7.13	E.A.K.
1398/3	King Cedric	P. McMahon ..	Camperdown ..	27.8.13	E.A.K.
1330/3	King of the Kings ..	O. Maroske ..	New Zealand Exam. ..	13.6.13	..
1291/3	King of the Roses II. ..	F. Jones	Newmarket	21.7.13	R.G.
1350/3	King of the Valley ..	C. B. Woodyard ..	Wangaratta ..	7.8.13	R.G.
1304/3	Laird of Invermay ..	G. W. Burrows ..	New Zealand Exam. ..	27.5.13	.
1282/3	Laird of Selkirk ..	W. Troy	New Zealand Exam. ..	26.6.13	.
1244/3	Laird of Stafford ..	F. C. Thomas ..	Horsham	1.7.13	E.A.K.
1369/3	Lanark Again	P. H. Müller ..	Dimboola	13.8.13	E.A.K
1379/3	Livingstone	E. and A. Breen ..	Kyabram	21.8.13	R.G.
1428/3	Lothan Derby ..	A. Dickens ..	Tatura	21.8.13	R.G.
204/3	Lyon Chief	Mitchell and O'Brien	City Horse Bazaar ..	18.6.13	R.G.
1427/3	Lord Alpha	F. Austin	Lara Special.. ..	30.9.13	R.G.
1430/3	Lord Bindi	R. T. Yapp ..	Omeo	8.10.13	R.N.J.
1249/3	Lord Cashier	A. and J. H. Young	Horsham .. .	2.7.13	R.G.
1293/3	Lord Cecil	J. Adams ..	Newmarket	21.7.13	R.G.
1205/3	Lord Chancellor ..	J. E. Small ..	City Horse Bazaar ..	18.6.13	E.A.K.
1417/3	Lord Dunwell	J. P. Slattery ..	Ballarat	12.9.13	R.G.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner	Parade.	Date of Examination.	Officer.
	Draughts—*continued.*				
1376/3	Lord Huntly	A. W. Butcher ..	Rochester	19.8.13	R.G.
1227/3	Lord Ivanhoe	R. N. Herkes ..	Newmarket	23.6.13	R.G.
1329/3	Lord Liverpool ..	J. R. Mackenzie ..	New Zealand Exam. ..	13.6.13	..
1236/3	Lord Melbourne ..	P. Small	Agricultural Offices .	28.6.13	E.A.K.
1305/3	Lord Nimmo	G. Burrows ..	New Zealand Exam. ..	27.5.13	..
1306/3	Lord Springbank ..	D. Vaughan ..	New Zealand Exam. ..	9.5.13	..
1415/3	Lord Vanquisher ..	A. Millar	Bacchus Marsh ..	11.9.13	R.G.
1294/3	McBride of View Point ..	Canobio Bros. ..	Newmarket	21.7.13	R.N.J.
1424/3	McClelland's Pride ..	R. Guest	Royal Show ..	20.9.13	E.A.K.
1295/3	Major Blue	W. H. Sanders ..	Newmarket	21.7.13	R.N.J.
1364/3	Major Carmyle ..	J. Hamilton ..	Bendigo (Special) ..	14.8.13	G.H.
1265/3	Major Style	J. Kelly, junr. ..	City Horse Bazaar ..	14.7.13	R.N.J.
1243/3	Malcolm Style ..	W. Bodey	Horsham	1.7.13	R.G.
1228/3	Martindale	J. R. Henry ..	Newmarket	23.6.13	R.G.
1355/3	Massey's Pride.. ..	J. O'Callaghan ..	Watchem	7.8.13	E.A.K.
1237/3	Meadow Bank Prince Rufus	Robb Bros. ..	Agricultural Offices ..	28.6.13	E.A.K.
1229/3	Merry Boy	A. Robertson ..	Newmarket	23.6.13	E.A.K.
1230/3	Merry Chief	W. Bartholomew ..	Newmarket	23.6.13	E.A.K.
1213/3	Merry Hero	T. Wallbridge ..	New Zealand Exam. ..	15.5.13	..
1412/3	Model Prince	P. E. Mathers ..	Maffra	4.9.13	E.A.K.
1351/3	Modest King	B. Jones	Wangaratta ..	7.8.13	R.G.
1328/3	Momona	J. R. Henry ..	New Zealand Exam. ..	27.5.13	..
1202/3	Naval Prince	Kennedy and Walters	City Horse Bazaar ..	18.6.13	R.G.
1266/3	Ned	H. E. Thomas ..	City Horse Bazaar ..	14.7.13	E.A.K.
1277/3	Newfield's Baron ..	J. Duxson	Newmarket (Special) ..	17.7.13	G.H.
1190/3	Newton Banks ..	W. J. T. Clarke ..	New Zealand Exam. ..	3.4.13	..
1191/3	Newton Stewart ..	J. W. Blair ..	New Zealand Exam. ..	3.4.13	..
1307/3	Newton's Style ..	A. Austin ..	New Zealand Exam. ..	26.6.13	..
1238/3	Newton Style	M. J. Caffrey ..	Agricultural Offices ..	28.6.13	R.N.J.
1201/3	Noble Knight	Mitchell and O'Brien	City Horse Bazaar ..	18.6.13	E.A.K.
1280/3	Orefia Jack	A. E. Cockram ..	New Zealand Exam. ..	9.5.13	..
1218/3	Overton	A. McCallum ..	Newmarket	23.6.13	E.A.K.
1219/3	Paterangi Chief ..	M. J. Caffrey ..	Newmarket	23.6.13	E.A.K.
1367/3	Patriarch's Pride ..	M. O'Brien ..	Cobram	15.8.13	R.G.
1210/3	Premier Again.. ..	Mithell and O'Brien	City Horse Bazaar ..	18.6.13	R.G.
1416/3	Premier Darnley ..	A. Miller	Bacchus Marsh ..	11.9.13	R.G.
1308/3	Premier Jock	D. Stavely ..	New Zealand Exam. ..	20.5.13	..
1296/3	Premier Massey ..	A. L. and E. M. Walter	Newmarket	22.7.13	R.N.J.
1309/3	Premier Scot	J. Adams	New Zealand Exam. ..	20.5.13	..
1327/3	Pride of Invermay ..	J. R. Henry ..	New Zealand Exam. ..	27.5.13	..
1362/3	Pride of the Plain ..	Rice Bros. ..	Geelong	14.8.13	E.A.K.
1297/3	Pride's Baron	T. Wallbridge ..	Newmarket	21.7.13	R.G.
1407/3	Prince Aldie	Brock Bros. ..	Morwell	2.9.13	E.A.K.
1325/3	Prince Charlie of Fortrose	J. R. Henry ..	New Zealand Exam. ..	12.6.13	..
1346/3	Prince Edward ..	D. King and Sons ..	Rutherglen	4.8.13	R.G.
1418/3	Prince of Millfield ..	A. R. Lister ..	Ballarat	12.9.13	R.G.
1343/3	Prince of Nullan ..	J. Annison ..	Warracknabeal ..	1.8.13	E.A.K.
1326/3	Prince Royal	E. S. Wright ..	New Zealand Exam. ..	27.5.13	..
1298/3	Professor	J. Egan	Newmarket	21.7.13	E.A.K.
1220/3	Rhodes Champion ..	M. J. Caffrey ..	Newmarket	23.6.13	R.G.
1231/3	Riccall Champion ..	A. T. Creswick ..	Newmarket	23.6.13	E.A.K.
1267/3	Riccarton Bay.. ..	D. McClure ..	City Horse Bazaar ..	14.7.13	R.N.J.
1276/3	Robins' Pride	D. Hyslop.. ..	City Horse Bazaar ..	16.7.13	E.A.K.
1394/3	Rob Roy	G. Butler	Maryborough ..	27.8.13	R.G.
1402/3	Royal Arthur	Gilmore Bros. ..	Colac	29.8.13	E.A.K.
1268/3	Royal Connection ..	G. T. Chirnside ..	City Horse Bazaar ..	14.7.13	R.G.
1269/3	Royal Dick	P. McFarlane ..	City Horse Bazaar ..	14.7.13	R.G.
1310/3	Royal Empire	M. J. Forrest ..	New Zealand Exam. ..	12.6.13	..
1404/3	Royal Favourite ..	A. D. Rowan ..	Werribee	30.8.13	E.A.K.
1359/3	Royal Herod	Jeffrey Bros. ..	Swan Hill	13.8.13	R.N.J.
1311/3	Royal Navy	J. McIlwain ..	New Zealand Exam. ..	12.6.13	..
..	Royal Oak	F. W. Lewis ..	South Australian Exam	7.7.13	..
1299/3	Royal Plumes	H. W. Reid ..	Newmarket	21.7.13	R.G.
1270/3	Royal Ribbon	W. and S. Chambers	City Horse Bazaar ..	14.7.13	E.A.K.
1211/3	Royal Stewart ..	J. McEwen ..	New Zealand Exam. ..	2.4.13	..
1256/3	Royal Thistle	Ryder Bros. ..	New Zealand Exam. ..	30.5.13	..
1312/3	Sandy McCormack ..	C. H. Feldtman ..	New Zealand Exam. ..	9.5.13	..
1403/3	Scotland's Bloom ..	J. Wylie	Colac	29.8.13	E.A.K.
1257/3	Scottie	T. Thornton ..	Numurkah	9.7.13	R.G.
1319/3	Shepherd's Fancy ..	A. L. and E. M. Walter	New Zealand Exam. ..	27.5.13	..

List of Terminable Certificated Stallions—*continued.*

Draughts—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1279/3	Shepherd Soldier	Geelong Harbour Trust	City Horse Bazaar	13.7.13	E.A.K.
1433/3	Shepherd's Pride	J. R. Stokes	New Zealand Exam.	27.5.13	..
1323/3	Silver Crown	J. R. Henry	New Zealand Exam.	17.6.13	..
1271/3	Silver Joe	T. Griffiths	City Horse Bazaar	14.7.13	E.A.K.
1322/3	Silver King	F. Howell	New Zealand	17.6.13	..
1434/3	Souter Jock	P. Le Roux	Lang Lang	2.9.13	R.N.J.
1255/3	Speciality II.	J. Annison	Horsham	1.7.13	E.A.K.
1381/3	Stanhope Jock	Kennedy and Walter	Tatura	21.8.13	R.G.
1392/3	Stockman	C. H. Perkins	Rainbow	26.8.13	R.G.
1192/3	Stranraer	R. W. Leake	New Zealand Exam.	3.4.13	..
1425/3	Sir Alick	Tippett Bros.	Royal Show	20.9.13	R.G.
1209/3	Sir Arthur	W. Vaught	City Horse Bazaar	18.6.13	R.G.
1232/3	Sir Everest	F. Howell	Newmarket	23.6.13	R.G.
1324/3	Sir Hector	T. Wallbridge	New Zealand Exam.	17.6.13	..
1353/3	Sir Lawrence	H. Knight	St. Arnaud	6.8.13	E.A.K.
1300/3	Sir Mac	A. J. Donaldson	Newmarket	21.7.13	R.G.
1272/3	Sir Richard	Coulson, Hay and Co.	City Horse Bazaar	14.7.13	E.A.K.
1313/3	Sir Roger's Heir	G. Stokes	New Zealand Exam.	20.5.13	..
1339/3	Sir Watter	H. C. Hateley	Murtoa	30.7.13	E.A.K.
1320/3	Taieri Hero	Metropolitan Board of Works	New Zealand Exam.	2.7.13	..
1208/3	Taieri Hero	Mitchell and O'Brien	City Horse Bazaar	18.6.13	E.A.K.
1233/3	Thorndale	A. Robertson	Newmarket	23.6.13	E.A.K.
1274/3	Timepiece	J. Archibald	City Horse Bazaar	14.7.13	R.N.J.
1321/3	Tom Black	P. Sullivan	New Zealand Exam.	27.5.13	..
1389/3	Top Gallant	F. L. McIntosh	Jeparit	22.8.13	E.A.K.
1419/3	The Baron	C. T. Henderson	Ballarat	12.9.13	R.G.
1340/3	The Baron	J. Bodey	Murtoa	30.7.13	E.A.K.
1393/3	The Crown	S. Atwell	Rainbow	26.8.13	R.G.
1207/3	The Factor	Mitchell and O'Brien	City Horse Bazaaz	18.6.13	R.G.
1273/3	The Fashion	J. Logan, junr.	City Horse Bazaar	14.7.13	R.N.J.
1374/3	The Leader	T. H. Laidlaw	Hamilton	19.8.13	R.N.J.
1301/3	The Sentinel	J. Ellery and Sons	Newmarket	21.7.13	R.N.J.
1245/3	Waltham	Gawith Bros.	Horsham	1.7.13	R.G.
1348/3	Warrego	J. F. Pinn	Myrtleford	6.8.13	R.G.
1354/3	Wee MacGregor	Spence Bros.	St. Arnaud	6.8.13	E.A.K.
1318/3	Wingatui	A. L. and E. M. Walter	New Zealand Exam.	27.5.13	.
1349/3	Young Hector McDonald	Witherow Bros.	Myrtleford	6.8.13	R.G.
1360/3	Young Hero	A. Ward	Swan Hill	13.8.13	R.N.J.
1315/3	Young Hero	G. Stokes	New Zealand Exam.	27.5.13	..
1366/3	Young Herod	A. R. Douglas	Kerang	14.8.13	R.N.J.
1316/3	Young Kitchener	P. Sullivan	New Zealand Exam.	17.6.13	..
1383/3	Young True Blue	B. J. Arthur	Kaniva	21.8.13	E.A.K.

LIGHTS.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1385/3	Billie Wilks	G. A. Crozier	Shepparton	22.8.13	R.G.
1400/3	Captain J.	J. S. Tait	Warrnambool	28.8.13	E.A.K.
1336/3	Direct Dell	J. Proctor, junr.	Boort	29.7.13	R.G.
1396/3	Emulator's Pride	W. MacArthur	Terang	25.8.13	E.A.K.
1422/3	Final Edition	J. Cockbill	Royal Show	22.9.13	E.A.K.
1378/3	Goldenwood	J. T. Ovens	Kyabram	21.8.13	R.G.
1368/3	Hymeneus	W. McMeekin	Mystic Park (Special)	14.8.13	R.N.J.
1409/3	Honest Wilks	F. English	Warragul	4.9.13	R.G.
1357/3	Match It	R. J. Wakeman and Sons	Pyramid	11.8.13	R.N.J.
1246/3	Obligation	J. McClounan	Horsham	1.7.13	E.A.K.
1420/3	Rectangle	P. M. Larsen	Tallangatta	15.9.13	R.N.J.
1317/3	Ribbonlead	R. Smith	Bendigo	24.7.13	E.A.K.
1426/3	Sir Fulham	J. Cockbill	Royal Show	22.9.13	R.G.
1370/3	Sir Norval	J. D. Hartwich	Hamilton	19.8.13	R.N.J.
1375/3	South Wind	Wm. Fradd	Boort	29.7.13	R.G.
1429/3	Von G.	J. Clark	Kyneton	10.10.13	E.A.K.
1387/3	Zolock, O.	D. McLeod	Shepparton	22.8.13	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	PONIES.				
1405/3	Black Watch	G. Patterson	Foster	1.9.13	R.N.J.
1408/3	Brightlight	J. M. Brown	Korumburra	3.9.13	R.N.J.
1347/3	Dandy King	H. Radford	Minyip	7.8.13	R.N.J.
1431/3	*Dandy Nat*	*E. E. Small*	*Wonthaggi*	*15.10.13*	*R.G.*
1395/3	Fireaway	J. Edson	Kaniva	21.8.13	E.A.K.
1253/3	Fireaway	J. Pipkorn	Horsham	2.7.13	E.A.K.
1382/3	*Gibbie*	*W. Sanders*	*Kaniva*	*21.8.13*	*E.A.K.*
1411/3	Glenroy	J. Robertson	Maffra	4.9.13	E.A.K.
1345/3	*Heart of Argyle*	W. Connors	*Myrtleford*	6.8.13	R.G.
1386/3	*King Toby*	*J. Kendall*	*Shepparton*	*22.8.13*	*R.G.*
1342/3	Mountain Palm	F. W. Schickerling	Warracknabeal	1.8.13	E.A.K.
1414/3	Silverlight	R. T. Jarvis	Corryong	10.9.13	R.N.J.
1413/3	*Stylish Lad*	*E. J. Watson*	*New Zealand Exam.*	*26.6.13*	.
1401/3	Young Bracey	D. W. Battarbee	Warrnambool	28.8.13	E.A.K.

(Two-year-old Certificates expiring 30th June, 1914.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	DRAUGHTS.				
216/2	Australian Officer	G. Oxley, junr.	Bendigo	14.8.13	G.H.
223/2	*Baron Scott*	*J. Widdicombe*	*Daylesford*	*10.9.13*	E.A.K.
226/2	Black Oak	E. Bourke	Kyneton	10.10.13	E.A.K.
212/2	Conqueror	Bodey Bros.	Horsham	1.7.13	R.G.
214/2	*Craigwillie*	*M. J. Caffrey*	*Newmarket*	*22.7.13*	E.A.K.
210/2	Duke of Dahlen	E. A. Dahlenburg	Horsham	1.7.13	R.G.
221/2	Fashion's Model	A. B. Hamilton	Foster	1.9.13	R.N.J.
207/2	Imperial Newton	E. H. Holte	Hamilton	19.8.13	R.N.J.
222/2	Leona	P. Kallady	Yarram	4.9.13	R.N.J.
209/2	Lord Grant	W. French	Newmarket	23.6.13	E.A.K.
211/2	Patriotic	G. Greenaway	Horsham	1.7.13	R.G.
224/2	Pride of the Mains	M. M. Muir	Ballan	12.9.13	E.A.K.
213/2	Royal Salute	J. Bodey and Sons	Horsham	2.7.13	R.G.
218/2	Royal Son	J. J. Gleeson	Warrnambool	28.8.13	E.A.K.
219/2	Valley Prince	J. Ball	Werribee	30.8.13	E.A.K.
225/2	Woodstock	J. Graham	Ballan	12.9.13	E.A.K.
	LIGHT.				
220/2	Blue Wilks	J. W. McNeill	Mirboo North	1.9.13	E.A.K.
	PONY.				
215/2	Royal George III.	Bell Bros.	Geelong	14.8.13	E.A.K.

STALLION PARADES.

TIME TABLE.

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
SPECIALS.				
Every Saturday, 27th June to 19th December	Agricultural Offices	10 a.m. to 12 noon		
1st and 2nd July ..	Horsham* ..	10 a.m.		
8th July	Numurkah ..	2 p.m.		
13th to 18th July ..	City Horse Bazaar	10 a.m.		
23rd July	Bendigo ..	1.30 p.m.	11.20 a.m. ..	3.15 p.m.
20th to 25th July ..	Royal Show Grounds	10 a.m.		
MALLEE No. 1.				
Tuesday, 28th July ..	Quambatook*	9.30 a.m.	6.35 p.m. (27th)	10.50 a.m.
Tuesday, 28th July ..	Boort* ..	3 p.m. ..	12.12 p.m. ..	6.10 a.m. (29th)
Wednesday, 29th July	Charlton ..	2 p.m. ..	9.17 a.m. ..	4.28 p.m.
Thursday, 30th July	Sea Lake* ..	3 p.m. ..	9.55 p.m. (29th)	6.40 a.m. (31st)
Friday, 31st July ..	Wycheproof	10 a.m. ..	10 a.m. ..	11.20 a.m.
WIMMERA No. 1.				
Wednesday, 29th July	Murtoa ..	2 p.m. ..	12.30 p.m. ..	4.30 p.m.
Thursday, 30th July	Beulah ..	2 p.m. ..	8 a.m. ..	8.30 p.m.
Friday, 31st July ..	Hopetoun* ..	9.30 a.m.	9.30 p.m. (30th)	10.50 a.m.
WIMMERA No. 2.				
Wednesday, 29th July	*Goroke** ..	*3.45 p.m.*	*3.40 p.m.* ..	*6.30 a.m. (30th)*
Thursday, 30th July	Edenhope* ..	3 p.m. ..	12 noon ..	1.30 p.m. (31st)
MALLEE No. 2.				
Monday, 3rd Aug. ..	Heathcote ..	2 p.m. ..	11.41 a.m. ..	8.17 p.m.
Tuesday, 4th Aug. ..	St. Arnaud*	3.30 p.m.	3.22 p.m. ..	11.32 p.m.
Wednesday, 5th Aug.	Donald ..	2 p.m. ..	12.21 a.m. ..	6 p.m.
Thursday, 6th Aug. ..	Watchem* ..	2 p.m. ..	7.27 p.m. (5th)	7.10 p.m.
Friday, 7th Aug. ..	Birchip* ..	3 p.m. ..	7.45 p.m. (6th)	3.15 a.m. (8th)
NORTH-EASTERN No. 1.				
Monday, 3rd Aug. ..	Tungamah*	3 p.m. ..	1.16 p.m. ..	1.16 p.m. (4th)
Tuesday, 4th Aug. ..	Yarrawonga*	2 p.m. ..	2 p.m. ..	7 a.m. (5th)
Wednesday, 5th Aug.	Myrtleford*	3 p.m. ..	2.54 p.m. ..	7.27 a.m. (6th)
Thursday, 6th Aug. ..	*Rutherglen**	*2 p.m.* ..	*1.48 p.m.* ..	*8.24 a.m. (7th)*
Friday, 7th Aug. ..	Wangaratta	2 p.m. ..	9.34 a.m. ..	4.37 p.m.

NOTE.—At places marked * a lecture may be arranged on request of Agricultural Society.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
WIMMERA No. 3.				
Wednesday, 5th Aug.	Beaufort	3 p.m.	12.27 p.m.	8.35 p.m.
Thursday, 6th Aug.	Minyip	2 p.m.	6.53 a.m.	5.2 p.m.
Friday, 7th Aug.	Warracknabeal*	10 a.m.	5.52 p.m. (6th)	11.15 a.m.
MALLEE No. 3				
Monday, 10th Aug.	Pyramid*	3 p.m.	2.15 p.m.	2.15 p.m. (11th)
Wednesday, 12th Aug.	Swan Hill*	2 p.m.	5.31 p.m. (11th)	12 noon (13th)
Thursday, 13th Aug.	Kerang*	2 p.m	1.39 p.m.	6 a.m. (14th)
Friday, 14th Aug.	Elmore	2 p.m.	1.11 p.m.	5.22 p.m.
NORTH-EASTERN No. 2.				
Monday, 10th Aug.	Dookie	2 p.m.	12.52 p.m.	4.11 p.m.
Tuesday, 11th Aug.	Cobram*	2 p.m.	10.52 p.m. (10th)	5.3 a.m. (12th)
Wednesday, 12th Aug.	Nathalia	1.45 p.m.	1.40 p.m.	3.25 p.m.
Thursday, 13th Aug.	Shepparton*	2 p.m.	5.29 p.m. (12th)	5.49 p.m.
Friday, 14th Aug.	Murchison*	9.30 a.m.	7.52 p.m. (13th)	10.45 a.m.
Friday, 14th Aug.	Rushworth	2 p.m.	11.48 a.m.	5.20 p.m.
NORTH-EASTERN No. 3.				
Tuesday, 11th Aug.	Seymour	2 p.m.	8.47 a.m.	6.1 p.m.
Wednesday, 12th Aug.	Euroa*	2 p.m.	6.57 p.m. (11th)	6.32 p.m.
Wednesday, 12th Aug.	Balmoral*	12 noon	10.30 a.m.	12.30 p.m. (13th)
Thursday, 13th Aug.	Geelong	3 p.m.	12.49 p.m.	5.45 p.m.
Friday, 14th Aug.	Frankston	3 p.m.	2.38 p.m.	5.40 p.m.
WESTERN No. 1.				
Monday, 17th Aug.	Ararat*	3 p.m.	1.29 p.m.	7.15 a.m. (18th)
Tuesday, 18th Aug.	Hamilton	2 p.m.	9.55 a.m.	5.30 p.m.
Wednesday, 19th Aug.	Coleraine*	10 a.m.	6.45 p.m. (18th)	11 a.m. (Driving)
Wednesday, 19th Aug.	Casterton*	3 p.m.	1 p.m. (Driving)	8.35 a.m. (20th)
Thursday, 20th Aug.	Portland	2 p.m.	1.2 p.m.	3 p.m.
Friday, 21st Aug.	Port Fairy*	2 p.m.	12.19 a.m.	5.45 a.m. (22nd)
WIMMERA No. 4.				
Tuesday, 18th Aug.	Kaniva*	2 p.m.	2.28 a.m.	12.42 a.m. (19th)
Wednesday, 19th Aug.	Nhill*	2 p.m.	1.24 a.m.	8.47 a.m. (20th)
Thursday, 20th Aug.	Dimboola*	2 p.m.	10.19 a.m.	11 a.m. (21st)
Friday, 21st Aug.	Jeparit	2 p.m.	12.23 p.m.	9.53 p.m.
GOULBURN VALLEY No. 1.				
Monday, 17th Aug.	Castlemaine*	2 p.m.	10.20 a.m.	10.32 a.m. (18th)
Tuesday 18th Aug.	Rochester*	2 p.m.	1.36 p.m.	9.57 p.m.
Wednesday, 19th Aug.	Echuca*	1 p.m.	10.23 p.m. (18th)	2.55 p.m.
Thursday, 20th Aug.	Tatura*	10 a.m.	6 p.m. (19th)	11.42 a.m.
Thursday, 20th Aug.	Kyabram	2 p.m.	12.50 p.m.	4.20 p.m.
Friday, 21st Aug.	Benalla*	2 p.m.	7.41 p.m. (20th)	5.35 p.m.

* [illegible] of Agricultural Society.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
CENTRAL No. 1.				
Monday, 24th Aug. ..	Clunes ..	1.45 p.m.	1.42 p.m. ..	3 p.m.
Tuesday, 25th Aug. ..	Mildura* ..	2 p.m. ..	7.8 a.m. ..	8 a.m. (26th)
Wednesday, 26th Aug.	*Ouyen** ..	2 p.m. ..	*10.30 a.m.* ..	*10.15 p.m.*
Thursday, 27th Aug.	Maryborough*	2 p.m. .	10 a.m. ..	6.5 a.m. (28th)
Friday, 28th Aug. ..	Inglewood ..	11 a.m. ..	8.40 a.m. ..	2.10 p.m.
Friday, 28th Aug. ..	Dunolly ..	4 p.m. ..	3.50 p.m. ..	5.17 p.m.
NORTH-EASTERN No. 4.				
Monday, 24th Aug. ..	Stawell* ..	3 p.m. .	2.33 p.m. ..	10.23 p.m.
Tuesday, 25th Aug. ..	Rainbow ..	3 p.m. ..	2.5 p.m. ..	8.10 p.m.
Thursday, 27th Aug.	Alexandra ..	2 p.m. ..	12.35 p.m. ..	4.40 p.m.
Friday, 28th Aug. ..	Yea* ..	9.30 a.m. ..	6.33 p.m. (27th)	10.33 a.m.
Friday, 28th Aug. ..	*Mansfield* ..	2 p.m. ..	1.50 p.m. ..	3.30 p.m.
WESTERN No. 2.				
Monday, 24th Aug. ..	Terang ..	2 p.m. ..	12.44 p.m. ..	9.53 p.m.
Tuesday, 25th Aug. ..	Penshurst ..	2 p.m. ..	10.15 a.m. ..	4.50 p.m.
Wednesday, 26th Aug.	Camperdown*	2 p.m. ..	8.46 a.m. ..	9.18 p.m.
Thursday, 27th Aug.	Warrnambool*	2 p.m. ..	10.58 p.m. (26th)	7.11 a.m. (28th)
Friday, 28th Aug. ..	Colac* ..	2 p.m. ..	10.9 a.m. ..	5.55 a.m. (29th)
Saturday, 29th Aug.	Werribee ..	10 a.m. ..	8.56 a.m. ..	1.36 p.m.
GIPPSLAND No. 1.				
Monday, 31st Aug. ..	Mirboo ..	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
Tuesday, 1st Sept. ..	Morwell* ..	10 a.m. ..	5.55 p.m. (31st)	11.57 a.m.
Tuesday, 1st Sept. ..	Traralgon* ..	2 p.m. ..	12.10 p.m. ..	12.20 p.m. (2nd)
Wednesday, 2nd Sept.	*Bairnsdale**	*3.30 p.m.*	*3.25 p.m.* ..	*5.40 a.m. (3rd)*
Thursday, 3rd Sept. ..	Sale* ..	2 p.m. ..	7.15 a.m. ..	7.40 a.m. (4th)
Friday, 4th Sept. ..	*Bunyip* ..	*2 p.m.* ..	*11.25 a.m.* ..	*4.26 p.m.*
Saturday, 5th Sept. ..	Melton ..	11 a.m. ..	8.41 a.m. ..	1.21 p.m.
NORTH-EASTERN No. 5.				
Tuesday, 1st Sept. ..	Tallangatta*	2 p.m. ..	4.35 p.m. (31st)	5 a.m. (2nd)
Wednesday, 2nd Sept.	Corryong* ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (3rd)
GIPPSLAND No. 2.				
Monday, 31st Aug. ..	Dalyston* ..	2 p.m. ..	10.49 a.m. ..	7.10 a.m. (1st)
Tuesday, 1st Sept. ..	Leongatha*	1 p.m. ..	11.11 a.m. ..	7.25 a.m. (2nd)
Wednesday, 2nd Sept.	Dandenong	3 p.m. ..	10.38 a.m. ..	5.21 p.m.
Thursday, 3rd Sept. ..	Berwick ..	11 a.m. ..	9.8 a.m. ..	1.1 p.m.
Thursday, 3rd Sept. ..	Warragul* ..	3 p.m. ..	2.37 p.m. ..	10.45 a.m. (4th)
Friday, 4th Sept. ..	Trafalgar ..	2 p.m. ..	11.16 a.m. ..	6.51 p.m.

NOTE.—*At places marked * a lecture may be arranged on request of Agricultural Society.*

STALLION PARADES. TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
GIPPSLAND No. 3.				
Monday, 7th Sept. ..	Lilydale ..	2 p.m. ..	1.35 p.m. ..	5.20 p.m.
Tuesday, 8th Sept. ..	Foster ..	12.45 p.m.	12.40 p.m. ..	2.21 p.m.
Wednesday, 9th Sept.	Korumburra*	3 p.m. ..	4.45 p.m. (8th)..	6.34 p.m.
Thursday, 10th Sept.	Yarram ..	9.30 a.m.	9 a.m. ..	11.30 a.m.
Friday, 11th Sept. ..	*Lang Lang**	*2 p.m.* ..	*6.24 p.m. (10th)*	*6.24 p.m.*
CENTRAL No. 2.				
Monday, 7th Sept. ..	Mernda ..	2 p.m. ..	12.24 p.m. ..	8.23 p.m.
Tuesday, 8th Sept. ..	Kyneton* ..	2.30 p.m.	2.55 p.m. ..	8.32 a.m. (9th)
Wednesday, 9th Sept.	Daylesford*	2 p.m. ..	11.59 a.m. ..	7.8 a.m. (10th)
Thursday, *10th* Sept.	Kingston ..	2 p.m. ..	7.58 a.m. ..	5.22 p.m.
Friday, 11th Sept. ..	Ballarat* ..	2 p.m. ..	6.35 p.m. (10th)	7.10 p.m.
CENTRAL No. 3.				
Thursday, 10th Sept.	Bacchus Marsh*	2 p.m. ..	9 a.m. ..	9.11 a.m. (11th)
Friday, 11th Sept. ..	*Ballan* ..	*10 a.m.* ..	*10 a.m.* ..	*12.7 p.m.*
SPECIALS.				
Thursday, 17th Sept.	Kilmore ..	2 p.m. ..	9.8 a.m. ..	8.40 p.m.
21st–26th Sept. ..	Royal Show			
Wednesday, 30th Sept.	Romsey ..	2 p.m. ..	9.45 a.m. ..	5.25 p.m.
Tuesday, 6th Oct. ..	Orbost* ..	3 p.m. ..	2 p.m. ..	8 a.m. (7th)
Wednesday, 7th Oct.	Omeo* ..	3 p.m. ..	6.30 p.m. (6th)..	6.30 a.m. (8th)

NOTE.—At places marked * a lecture may be arranged on request of Agricultural Society.

EXPORTING CHEESE.—FAULTY PACKAGES.

By Geo. C. Sawers, Cheese Expert.

Notwithstanding the large number of dairymen who have recently taken up the business of cheesemaking, prices of prime quality cheese remain on a satisfactory level.

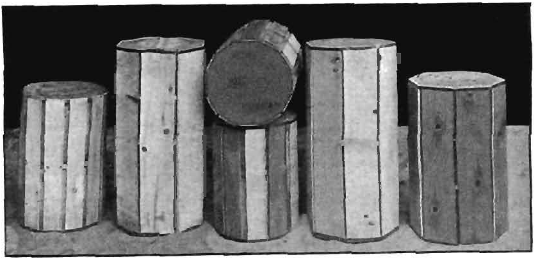
This is no doubt due to the enterprise and foresight of several of the factories and private makers, who, in order to avoid glutting the local market, put up a portion of their output for exporting to London.

For purpose of export, many of the lines forwarded to the Government Cool Stores in respect of style of packing and general appearance, could be much improved upon.

It was noticeable in several instances that cheese carried from a distance arrived at the stores in a heated, bruised, and broken condition, due to faulty crates, and consigning when weather conditions are unfavorable.

As cheese for export must be new, it is necessary to rail from the country on a cool day, otherwise the cheese will become heated, lose fat, causing a deterioration in flavour, and, in addition, is liable to burst, which renders it unfit for shipment. If the cheese were made to fit the cases exactly they could not become bruised and broken under normal conditions in transit. Faulty methods of packing and variations in weights should be avoided.

The accompanying illustration shows badly packed cheese; the cases are octagonal in shape, and the edges of battens not bevelled. The cheese consequently lies somewhat loosely in the case, and, with rolling, &c., in transit, becomes bruised and broken; the general appearance is also against the contents.



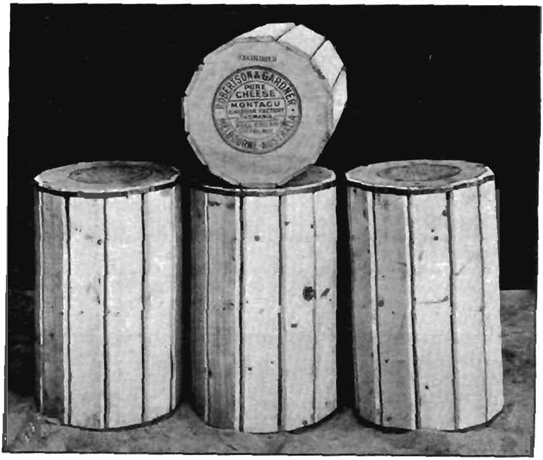
Faulty Packages.

Showing uneveness of size, eight-sided cases, sharp edges, uneven spacing of battens, and rough wood.

Makers for export should adopt a uniform style of case and evenness in size of cheese. The next illustration shows cheese cases of uniform size in shape, with neatly bevelled battens; the cheese lies snugly in an almost complete circle, and rolling in transit consequently does the contents no harm; the general finish with planed timber is an advertisement for the contents.

On inspecting the shipment of cheese for London per s.s. *Paparoa* in December last, cases used by different factories showed much variations both in style and weights of cheese, two cheese in some instances weighing 110 lbs.; others up to 130 lbs. per case.

To overcome this error, makers should always weigh the curd into the hoops, using 68 lbs. of green curd, which should give a pressed weight of 65 lbs. per cheese after leaving the press. Adopting this method would give a net weight of 60 lbs. each (packing allowance of 3 per cent. at time of shipment for drying).



Good Packages.

Showing even sizes, twelve-sided cases, planed wood, and bevelled edges.

Cases.

The average quality of cheese shipped per s.s. *Paparoa* was considerably better than previous shipments, and it is to be regretted that in many instances cheese of such quality was packed in dilapidated, dirty, and badly-branded cases. The extra cost of packing attractively could not be heavy, and, in their own interest, if the export trade in cheese develops as is anticipated, shippers would do well to put their goods on the market in a manner calculated to favorably impress a prospective buyer. All those interested in the packing of any produce for oversea markets are well aware that goods cleanly and attractively got up are more likely to appeal to buyers on the market to which they are consigned than goods of similar quality in dirty and irregular packages.

*Note.—This consignment has since been sold at from 63s. to 67s. 6d. per cwt.

HOW SULPHUR STIMULATES PLANT GROWTH.

F. de Castella, Government Viticulturist.

It has long been known that the sulphur used to defend vines against the Oidium Fungus (*Uncinula spiralis*) has a beneficial effect on their vegetation. Until recently the mechanism of such action was not understood.

As the result of a series of laboratory experiments with cultures of different micro-organisms, as described in *La Revue de Viticulture*, of 29th August, 1912, MM. Boullanger and Dujardin came to the conclusion that "the beneficial part played by flowers of sulphur is due to the stimulating influence exerted on the bacteria which break down complex nitrogenous substances to the ammonia form, and also on nitrifying ferments." In other words, though sulphur is capable of increasing fertility, it does not act as a plant food. "The ammonia formed is derived exclusively from the nitrogenous substances in the soil."

This explanation received further confirmation from the experiments of Vermorel and Dantony (communication to the Societé Nationale d'Agriculture of France, 5th November, 1913), in which the action of sulphur on wheat and beans, grown in pots, was investigated. Where nitrogen was supplied in the form of nitrate the addition of sulphur led to no increase in yield. On the other hand, in the pots supplied with the same quantity of nitrogen in an organic form (dried blood) the increase due to sulphur was considerable—30 per cent. for wheat and 60 per cent. for beans.

Experiments on a much larger scale have recently been conducted by M. J. Chauzit, Professor of Agriculture, at Villefranche-sur-Saône (France). These are described in *La Revue de Viticulture* of 12th February last. They confirm in a remarkable manner the conclusions arrived at by the previous investigators.

In M. Chauzit's investigations ½-acre plots of vines were operated on, two distinct series of experiments being conducted. The first dealt with the effect sulphur was capable of producing on soils which had not received farmyard manure (organic matter) since two, three, four, and five years.

The results were as follow:—

Time elapsed since last manuring.	Yield—gallons per acre.*		Increase due to sulphur.	Increased yield.
	Without sulphur.	With sulphur.		
			gallons.	per cent.
2 years	492	590	98	20·08
3 ,, ...	490	531	41	8·44
4 ,, ...	464	479	15	3·53
4 ,, ...	380	403	23	6·29
4 ,, ...	353	378	25	7·23
5 ,, ...	377	384	7	1·93

* M. Chauzit's results are stated in hectolitres per hectare—these have been reduced to gallons per acre. The percentages are as worked out by M. Chauzit. The omission of fractions of a gallon will explain any trifling discrepancies which may be observed.

Sulphur was applied at the rate of 200 kilogrammes to the hectare (180 lbs. per acre).

The above figures show clearly that the more recently the vines had been manured the more marked was the action of the sulphur. In the words of M. Chauzit, "as the quantity of organic matter diminishes in the soil, so also does the action of sulphur decrease, becoming nil in the total absence of organic matter."

The second series of experiments dealt with the action of sulphur:—

(*a*) whether it was mixed with manure or sown broadcast:

(*b*) according to the quantity used.

In each case (with or without sulphur) the farmyard manure was supplemented by a dressing at the rate of 180 lbs. muriate of potash and 360 lbs. superphosphate (14 to 16 per cent.) per acre.

The results were as follow:—

—	Yield—gallons per acre.*		Increase.	Increase.
	Without sulphur.	With sulphur.		
			gallons.	*per cent.*
Sulphur (top dressing) 200 kilos per hectare (180 lbs. per acre—				
1st Field	427	483	56	13·13
2nd "	410	456	46	9·20
3rd "	415	476	61	14·99
Sulphur mixed with manure 200 kilos per hectare (180 lbs. per acre)	504	598	94	18·79
Sulphur mixed with manure 400 *kilos per hectare (360 lbs. per acre)*—				
1st Field	509	690	181	35·64
2nd "	536	708	172	32·01

* M. Chauzit's results are stated in hectolitres per hectare—these have been reduced to gallons per acre. *The percentages are as worked out by M. Chauzit.* *The omission of fractions of a gallon will* explain any trifling descrepancies which may be observed.

M. Chauzit points out the agreement with the earlier experiments mentioned above, and draws the following conclusions:—

1. Sulphur acts favorably on the growth and on the yield of the vine.
2. The greater the quantity of organic matter in the soil the more pronounced is such action. When the quantity of organic matter diminishes, the effect of sulphur diminishes also, becoming practically *nil* in the absence of organic matter (as MM. Vermorel and Dantony have already proved).
3. The action of sulphur is all the more evident if it be thoroughly mixed with the organic matter on which it is to act.
4. The yield increases with an increase in the quantity of sulphur used.

The quantity of sulphur applied in M. Chauzit's experiments is certainly considerable—more so than is usually needed to combat oidium.

The three sulphurings looked upon as necessary in French vineyards, in normal seasons, entail the use of only 75 lbs. per acre (13 lbs., 26 lbs., and 36 lbs., according to Föex). In districts where oidium is virulent, or in very wet seasons, as many as seven or eight sulphurings may be needed. Owing to increased leaf surface, such late sulphurings must be heavier than earlier ones, and the total would be correspondingly increased.

Australian soils being usually deficient in organic matter, it is probable that the beneficial action of sulphur would be less marked with us than it has proved in France, except, of course, in the best worked vineyards, where green manuring is practised or bulky organic fertilizers are applied.

HINTS TO DAIRY FARMERS.

By R. T. Archer, Senior Dairy Inspector.

1. Don't feed strong smelling foods immediately before or during milking. Always after milking.
   Because the milk will absorb any odours that come in contact with it.
2. Don't forget to face your shed east and north.
   Because the morning sun helps to keep the shed sweet and wholesome.
3. *Don't neglect to put an impervious floor in the milking shed.*
   Because if the floor is not impervious urine and filth soak in, and milk will absorb smells arising therefrom. Brick or bluestone pitchers grouted with cement, or concrete, make good floors.
4. Don't neglect to limewash the sheds and dairy twice yearly.
   Because it helps to keep down flies, disease, and smells.
5. Don't neglect to have yards pitched or gravelled.
   Because souring and taint in milk are due to contamination, principally by germs found in manure; therefore, all manure must be regularly cleared away.
6. Don't smoke while milking or in the dairy.
   Because it leads to the production of a bad flavoured cream.
7. Don't milk with wet hands.
   Because the moisture will drip off the hands and contaminate the milk. Dry milking is easier and cleaner as soon as you are used to it.
8. Don't excite the cows or rush them about with dogs.
   Because this upsets their nervous system, affects the test, and decreases the yield of milk.
9. Don't allow the liquid or solid manure to go to waste. Always convey to manure pit.
   Because animal manure is exceptionally valuable in keeping up the fertility of the soil. In addition to its chemical constituents the *microbes*, with which it is teeming, are indispensable aids to plant growth. Manure from piggeries is particularly valuable; for instance, from every ton of pollard fed over £2 worth of manure is voided. Other feeds vary in manurial value according to composition. See *Journal of Agriculture*, June, 1913, p. 340.

10. Don't forget to clean cows udders and teats before milking.
Because dirt, hairs, &c., shaking off the udders will contaminate the milk.

11. Don't neglect to strain the milk.
Because dust and dirt will get in, and requires a double fold of buttercloth, or, better still, a "Ulax" strainer to remove immediately after milking.

12. Don't include beestings or the milk from a newly-calved cow.
Because the flavour and keeping quality of the produce will be spoilt thereby. Beestings is also nature's provision for the young calf.

13. Don't place the separator in the cow bails.
Because the cream will be contaminated by dust and smells.

14. Don't allow the separator to be set unevenly.
Because this will cause it to vibrate or run unevenly, and fat will be lost in the skim milk.

15. Don't allow the temperature of the milk below 80 deg. while separating.
Because lower temperature will likely result in loss of fat.

16. Don't heat the milk directly over a flame.
Because it will likely be burnt and flavour spoilt. Better heat when necessary by placing the can of milk in a vessel of boiling water.

17. Don't run the separator too slow.
Because loss of fat will be the result. The speed indicated by the maker is necessary.

18. Don't overfeed the separator.
Because fat will be lost in the skim milk, especially in autumn and winter, when it may be necessary to reduce the flow of milk to the separator.

19. Don't forget to wash the separator each time after it is used.
Because all the dirt that was in the milk is retained in the separator in the slime, &c., and by the time the next lot of milk is run through putrefaction has developed, and will spoil any milk or cream coming in contact with it.

20. Don't neglect to make frequent tests of skim milk.
Because much money may be lost in this way. Frequently 1 per cent. of fat is lost in skim milk. If 100 gallons a day is separated this would mean a loss of 10 lbs. of fat. At 1s. a pound that would amount to a loss of £3 10s. per week.

21. Don't neglect to cool the cream.
Because cooling the cream immediately it is separated checks the development of bacteria, drives off animal odours, and enables the production of better butter. It should be kept cool till sent to factory, if necessary, by wrapping a wet bag round or standing can in cold water.

22. Don't mix warm fresh cream with cold cream of a previous separating.
Because it will develop objectionable ferments and flavours in the

23. Don't forget to stir the cream night and morning with a clean stick.
    Because this helps to ripen it properly, and prevents a dry skin forming on top.

24. Don't keep cream until it is overripe.
    Because inferior butter and less money will result. In summer it should be sent to factory daily, and at no time kept more than two days.

25. Don't use utensils with the tin worn off.
    Because the acid of the cream attacks the iron, and objectionable metallic flavour in the butter results. Also, the iron becoming eaten away and honeycombed, there is an accumulation of filth which contaminates the cream.

26. Don't separate the cream too thin.
    Because the thinner it is the more milk is left in, and the quicker it goes off. The cream should not test less than 40 per cent. fat.

27. Don't forget to cover the can with butter cloth or wire.
    Because otherwise flies, dust, mice, &c., may get into the cream and contaminate it. It also allows gas to escape.

28. Don't store apples, kerosene, soap, &c., in dairy.
    Because cream will absorb the smells therefrom.

29. Don't use preservatives in milk or cream.
    Because this is prohibited by law.

30. Don't weigh your cans of cream on any but tested scales.
    Because if the scales are inaccurate the weights returned from the factories will not correspond, and will therefore lead to trouble.

31. Don't expose the cans of cream to the sun.
    Because the cream will be overheated, and produce greasy and bad-flavoured butter.

32. Don't forget to cleanse utensils immediately after each time they are used.
    Because the milk will dry on and make it difficult to remove. First rinse with cool water to remove the milk. Then scrub with hot water and soda. Scald with boiling water, in which ½ lb. washing soda to 10 gallons of water is used, or steam thoroughly, and leave upside down to drain and dry.

33. Don't use a cloth for cleansing dairy utensils.
    Because it is almost impossible to keep it clean and sweet, and a dirty dishcloth flavour is conveyed to the product.

34. Don't store away tinware without first coating with vaseline.
    Because damp will attack and cause it to rust.

35. Don't scour tinware with ashes, sand, or scratch with any hard substance.
    Because the tin will be rubbed off and utensil spoilt.

36. Don't be without a thermometer.
    Because it is necessary to check temperatures to obtain best results.

37. Don't neglect to weigh and test the milk of individual cows.
    Because many cows are fed at an absolute loss.

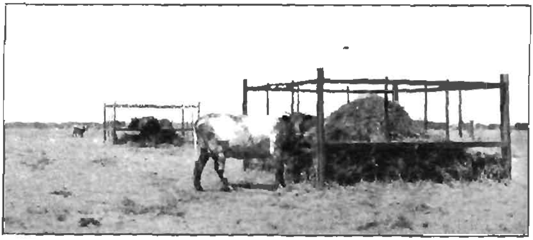
38. Don't forget that the Dairyman's motto is "Clean and Cool."

LUCERNE HAY FEEDING.

Temple A. J. Smith, Chief Field Officer.

A useful device for feeding lucerne hay, which can be cheaply constructed and is instrumental in saving waste where lucerne is fed to cattle in the open, has been brought under notice.

Where lucerne is fed to stock without some protection in the open a considerable amount is trampled under foot, and rendered dirty and unpalatable, the percentage of loss being high, especially in wet weather. It is not advocated that feeding in the open is desirable, but where insufficient cover is available, and outdoor distribution of hay is necessary, this structure will be found a material saving.



Four posts each 7 ft. 6 in. long are placed in the ground to a depth of 2 ft. 6 in. at a distance of 9 feet apart each way. Four strong rails 9 feet in length are mortised into the posts 2 feet from the ground level, and four more mortised into the same posts 2 ft. 6 in. above the lower rail. Braces are nailed on to the rails perpendicularly at intervals of 3 feet, and a No. 8 plain wire run through posts and braces midway between the rails and also between the lower rail and the ground level.

Angle braces running from each post 3 feet from the top to a distance of 2 feet along top rail, at every corner well bolted on, would be a further improvement, and greatly strengthens the whole, on which considerable pressure is sometimes brought to bear by straining cattle. The lucerne is deposited from the waggon over the rail to the centre, and the cattle pull it through the sides as required. The structure can be easily moved from place to place as desired.

INSECT PESTS OF FRUIT TREES.

No. 1.

THE LEAF-CASE MOTH (*Hyalarcta hubneri*, Westw.).

By C. French, Junr., Government Entomologist.

During the last two or three months numerous specimens of the Leaf-Case Moth have been received by the Science branch from correspondents, who state that these insects cause considerable damage to

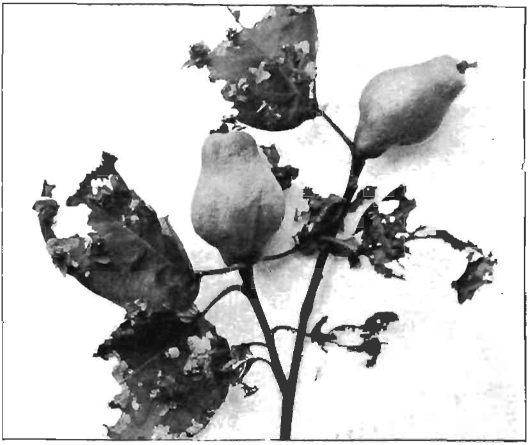


Fig. 1.—Leaf-Case Moth on Quince Leaves.

Fig. 2.—Leaf-Case Moth on Tea Tree (*leptospermum*).
Fig. 3.—Leaf-Case Moth (Nat. size).
Fig. 4.—Leaf Case Moth on Eucalyptus.

apples, quinces, grapes, &c. The insects usually bite a piece out of one fruit, and then pass on to another, until much of the fruit is damaged and useless. They eat the epidermis off the leaves, causing the trees to look as if a fire had scorched them. They are also partial to young buds, and as there are often fifty of them on a tree, the vast amount of damage they do can be readily understood. Native plants such as Tea Tree (*Leptospermum*), Eucalypts, and introduced plants such as Pines and Cupressus are eagerly sought after by these insects. Like many other native insects, this species has forsaken its natural food plants, and seems to prefer fruit and fruit tree leaves.

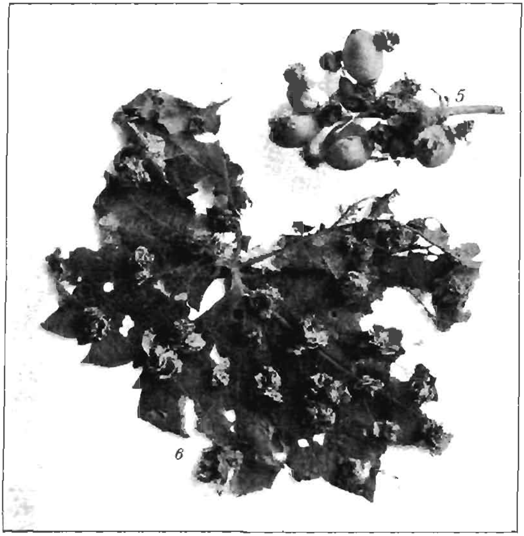


Fig. 5.—Leaf-Case Moth on Grapes.
Fig. 6.—Leaf-Case Moth on Vine leaves.

The caterpillar decorates the outside of its case with the leaves of the plant on which it is feeding; for instance, if it is on an apple tree it will use apple leaves, but if a half-grown specimen is removed from one plant to another it will use the leaves of the plant on which it is placed. The moth is small, measuring about 1 inch across the expanded wings, which are almost transparent. (See illustration).

Another closely allied moth is the Ribbed Case or Bag Moth (*Hyalarcta nigrescens*, Doubl.) which is also destructive to eucalypts, but it has not yet taken to damaging fruit trees.

REMEDIES.

This pest is easily destroyed by spraying with arsenate of lead. This material has been considerably reduced in price, and is now within the reach of all.

RUTHERGLEN EXPERIMENT FARM.

III.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

SELECTION AND VARIETY WHEAT TRIALS.

One of the most important problems confronting the farmer each season is the choice of suitable varieties of wheat for seeding. Quite a number of clearly defined types of wheat are now grown in Australia, and the difficulty of making a suitable choice is becoming increasingly difficult as new and improved varieties are introduced into general practice. In making his choice of varieties the farmer must be guided mainly by the prolificacy of the wheat under local conditions. Under existing methods of marketing wheat on an f.a.q. basis, no encouragement is given to a farmer to grow wheats of special milling quality, nor, indeed, is there any incentive to produce a prime sample of ordinary varieties.

Under these circumstances, the grower cannot be expected to favour other than those varieties that give the heaviest yields per acre irrespective of milling quality. The prolificacy of a given variety depends on its suitability for the soil and climatic conditions in which it is grown. Inasmuch as these conditions vary from one district to another, it is to be expected that the same varieties would give different yields in the climatically different districts of the State, *e.g.*, Mallee, Western District, and North-east. This, indeed, is what actually happens. In districts like the North-east and Goulburn Valley, with a fairly safe rainfall, Federation wheat has been deservedly popular, and has proved itself a prolific and reliable cropper. It is the most prolific variety yet introduced into these areas. In parts of the Mallee, however, and more particularly in the more newly settled North-West, this variety has by no means given universal satisfaction. Its returns have been disappointing, and, during the past few years, early varieties of good growing power like Mac's White and Gluyas have been largely grown, in spite of the shaking propensities of the former and the lodging tendencies of the latter. The shortness of straw of Federation—a property deliberately imparted to it by Farrer to make it suitable to the Australian methods of harvesting with the stripper or with the combined harvester—makes it an unsuitable type of wheat for contending with the vigorous Mallee shoots in the pioneer stages of settlement. The Mallee shoots creep above the crop of these short-growing varieties, and necessitate considerable expenditure on shoot cutting. Moreover, good stubble burns are difficult to obtain with short-strawed crops, and the cost of pioneering operations in clearing the Mallee considerably increased. Finally, the uncertainty and general insufficiency of the spring rains in these districts give early maturing varieties a marked advantage over late matur-

ing types. Other instances could be quoted to show that it is futile to expect the same variety of wheat to do equally well in all parts of the State. Varieties with an extended growing period and late maturing habits are naturally better suited to the moister and cooler districts. On the other hand the quick, early maturing varieties have a special value for dry, hot districts, and are of extreme value in seasons in which the seeding rains are belated.

In order to test the suitability of different varieties of wheat under North-Eastern conditions, and to gauge the yielding capacity when sown under similar conditions, a set of variety and selection tests were conducted at the Rutherglen Experiment Farm. The tests formed part of a systematic scheme for improving the prolificacy of the varieties distributed as seed from the Bulk Wheat Fields. In the complete scheme of improvement by selections four sets of plots are used—stud plots, selection plots, seed plots, bulk plots. In the stud rows, pure selected types of wheats derived originally from "pure lines" are grown each year. The selection plots are one-twentieth of an acre each in area,

Fig. 1.—View of Selection Plots.
Rutherglen Experiment Farm.

and originated in the first place from selected pure strains in the stud rows. From each of these selection plots sufficient graded seed from the best heads of the best plants is raised each season to sow a similar sized plot the following year. The rest of the selection plot is harvested to provide for the seed plot. In its turn, the seed plot provides seed for the bulk plots, the seed of which is distributed amongst farmers. Besides providing for gradual improvement of the bulk seed by repeated selection of the seed in the selection plots, the system of plots is used as a competitive ground for the ultimate choice of the most prolific types of wheat. To maintain a place in the bulk wheat trials a variety must continue to give satisfactory comparative yields in the seed and selection plots. In the same manner, in order that many of the new crossbred wheats which are now undergoing trials may find their way to the bulk wheat fields, it will be necessary for them to graduate from the selection and seed plots.

In the selection plots, twenty-eight varieties were sown, and three check plots of Federation. The results are shown in Table I.

TABLE I.

YIELDS OF SELECTION PLOTS, RUTHERGLEN, 1913.

No. of Plot.	Variety.	Yield per Plot.		Yield per Acre.	
		lbs.	ozs.	bus.	lbs.
1	Federation	102	0	34	0
2	Yandilla King	106	2	35	22
3	Genoa	80	7	26	48
4	American 8	103	5	34	26
5	Huguenot	73	11	24	33
6	Dart's Imperial	89	0	29	40
7	Zealand Blue	90	0	30	0
8	Marshall's No. 3	94	1	31	21
9	Triumph	96	15	32	18
10	White Tuscan	85	1	28	21
11	Federation (3rd Seln.)	109	10	36	32
12	Bobs	70	14	23	37
13	Warren	87	7	29	8
14	Bayah	92	11	30	53
15	Viking	95	10	31	52
16	Firbank	71	6	23	47
17	Thew	86	0	28	40
18	Bunyip	88	1	29	21
19	College Eclipse	112	9	37	31
20	Gluyas	88	5	29	26
21	King's Early	108	6	36	7
22	Commonwealth	90	15	30	18
23	Currawa	91	12	30	35
24	Cleveland	89	3	29	43
25	Gamma	82	10	27	32
26	Jonathan	73	4	24	25
27	White Fife	68	5	22	46
28	Minnesota 163	61	7	20	28
29	Purple Straw	78	7	26	8
30	Federation	101	0	33	40

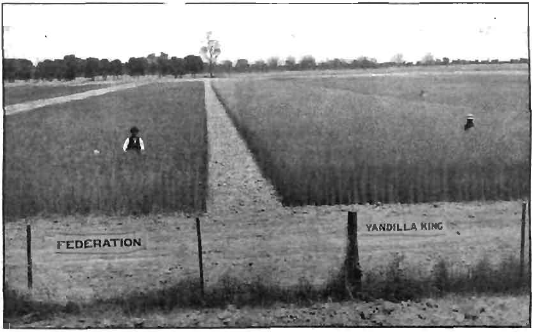


Fig. 2.—View of Variety Tests.

Rutherglen Experiment Farm.

Adjoining the selection plots were the variety trials, consisting of twenty-two plots, each of .45 acre in area. As far as possible, each set of plots were treated precisely alike. The methods and time of cultivation, allowances of seed and manure were alike on each section. The seed of the selection plots was obtained by hand selection by methods already described in this Journal. The thirty selection plots were sown on 13th May, the variety plots on 14th to 16th May inclusive. Wild oats to some extent interfered with and lowered the yields of some of the varieties in both sections. The yields from the variety plots were uniformly lower than the corresponding varieties in the selection plots. The results are shown in Table II.

Table II.

Results of Variety Tests, Rutherglen, 1913.

No.	Variety.	Weight, Firsts.	Weight, Seconds.	Total weight per Plot.	Yield per Acre.	
		lbs.	lbs.	lbs.	bus.	lbs.
1	Federation	735	24	759	29	11
2	Yandilla King	770	15	785	28	47
3	Genoa	490	27	517	19	41
4	American 8	562	38	600	23	7
5	Huguenot	281	28	309	12	0
6	Dart's Imperial	625	30	655	25	14
7	Zealand Blue	527	30	557	21	24
8	Marshall's	672	22	694	26	40
9	Triumph	576	23	599	23	4
10	White Tuscan	622	18	640	24	33
11	Federation	668	22	690	28	4
12	Bobs	441	40	481	17	40
13	Warren	442	38	480	18	31
14	Bayah	610	15	625	23	4
15	Viking	550	12	562	21	38
16	Firbank	437	8	445	17	0
17	Thew	542	23	565	21	44
18	Bunyip	606	9	615	23	36
19	College Eclipse	685	18	703	27	2
20	Gluyas	408	26	434	16	42
21	King's Early	565	10	575	22	7
22	Federation	665	25	690	26	31

A comparison of Table I. and Table II. will show that in the case of these varieties which are common to the selection and variety plots, there is a marked difference in yield in favour of the selected plots, ranging from a minimum increase of 3 bushels 48 lbs. in the case of White Tuscan to a maximum increase of 12 bushels 54 lbs. in the case of Gluyas. The average increase in yield of the twenty varieties in the selection plots compared with the same twenty varieties in the variety tests amounts to 8 bushels 10 lbs. per acre. In all cases the varieties in the selection plots gave higher yields than the same varieties in the seed plots. The tables demonstrate that the responsiveness of different varieties to selection varies considerably. As the range of variation is not constant in all varieties, it follows that the possibility of improvement by selection varies with the variety. This is confirmed by the results

of a special set of plots designed to test the normal range of variation from year to year of four standard varieties of wheat. These will be discussed in detail later.

GREEN MANURIAL AND FEEDING-OFF TESTS.

It is a matter of common observation that many of the soils in the older wheat-growing areas of the State have been depleted of much of the organic matter they formerly contained by more or less continuous cereal cropping. The loss of organic matter is manifested in the increased difficulty of ploughing old land as compared with virgin land, and by the fact that new land is much more productive than land that has been growing wheat for a number of years. Under natural conditions, the soil tends to accumulate nitrogen and organic matter, but with the introduction of the plough the balance is disturbed, and unless careful rotation systems are followed, the amount lost from the soil over a period of years may be considerable. Just at what rate organic matter is lost from the soil under Victorian conditions has not been accurately determined, but there can be little doubt that in those wheat areas where fallowing and stubble burning is regularly practised, and where cereal crops alone are grown, the loss must be considerable. Indeed, paradoxical as it may seem, the more thoroughly the land is fallowed and cultivated in the drier wheat areas, the greater is the drain on the soil's organic resources, and the worse it may be for the fertility of the farm. In the well-watered areas of the State, the drain of the organic matter may be considerable, but here, owing to the greater diversity of cropping, and the possibility of following crop rotations, the problem is not so acute.

The depletion of organic matter may be arrested in four ways:—

1. By the application of organic manures, such as farmyard manure.
2. By the ploughing in of green crops.
3. By feeding off forage crops with sheep, and ploughing in the residue.
4. By allowing the land to remain in pasture or grazing for a number of years.

The application of stable manure as a means of achieving this object is impracticable on large farms since the average holding is so large in comparison with the amount of manure produced on the farm. Nor can the average wheat farmer avail himself of the fourth alternative—allowing the land to remain indefinitely in grass. Soil renovation through the medium of green manures and feeding off of forage crops is, however, within the range of economical practice. The object of the tests in the green manurial section is to compare these two methods of soil renovation, and to compare the yields obtained when wheat is grown after green crops ploughed in and fed off with wheat grown after bare fallow.

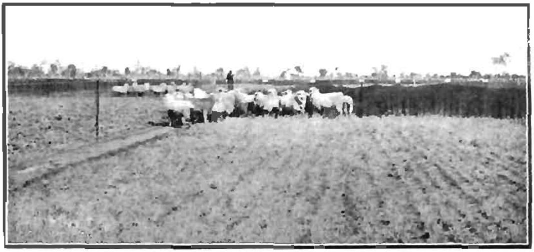
Twenty plots, each half acre in area, have been laid out, and in any one year ten plots will be sown to wheat, and eight with forages, whilst two will be in fallow. By alternating the forage and fallow plots with the ten wheat plots each year comparative results will be obtained of the value of wheat after each of the forages, when fed off, as compared

with wheat following the same forages ploughed in. Comparisons will also be made with the orthodox wheat after bare fallow. The following is the scheme of the plots:—

Plot.	1913.		Plot.	1914.	
1.	Rape	Ploughed in	1.	Wheat	
2.	Barley		2.	,,	
3.	Peas		3.	,,	
4.	Rye and Vetches		4.	,,	
5.	Bare Fallow		5.	,,	
6.	Rape	Fed off	6.	,,	
7.	Barley		7.	,,	
8.	Peas		8.	,,	
9.	Rye and Vetches		9.	,,	
10.	Bare Fallow		10.	,,	
11.	Wheat		11.	Rape	Ploughed in
12.	,,		12.	Barley	
13.	,,		13.	Peas	
14.	,,		14.	Rye and Vetches	
15.	,,		15.	Bare fallow	
16.	,,		16.	Rape	Fed off
17.	,,		17.	Barley	
18.	,,		18.	Peas	
19.	,,		19.	Rye and Vetches	
20.	,,		20.	Bare Fallow	

Thus, in the first four plots, Nos. 1, 2, 3, 4 (1913), and 11, 12, 13, 14 (1914), the whole of the forage crops are sacrificed for the benefit of future wheat crops, whilst in the case of plots Nos. 6, 7, 8, 9 (1913), and 16, 17, 18, 19 (1914), some immediate return is obtained, for these plots are fed off by sheep. In the former case, the cost of production and ploughing under of the green crop must be debited to the wheat crops, whilst in the latter case the value of the forage fed off requires to be estimated and taken into consideration. While increased crops of wheat may result from the ploughing in and feeding off of forage crops, as compared with bare fallow or continuous cropping with cereals, it would be of little advantage to the farmer if the increase of crop were insufficient to cover the extra working of the land. Accordingly, some system of estimating the value of forage fed off with sheep is necessary. It will be readily understood that the securing of the exact values of green forage of the character used for sheep is extremely difficult. The value of any given forage crop for feeding off with, say, sheep, depends, amongst other factors, on the nature of the season (whether grass is plentiful or not), the market values of fat stock, and the ease with which store sheep may be secured at prices which would admit of profit in feeding. In ordinary practice the value could be measured by purchasing store sheep, grazing them on the forage crops, and selling them when fat. The difference in the purchasing and selling price may be considered as equal to the value of the forage crop. It is, however, undesirable to follow such a method of estimation in experiments of this nature. The markets are always fluctuating, and the profits secured by the feeding off would very largely depend on the judgment displayed by the operator both in buying and in selling the sheep. The method which is most likely to lead to reliable results is to establish, if possible, a connexion between the tonnage of green forage produced and the increase of live weight of mutton per acre through feeding off. The fixing of the feeding value per ton of green fodder would eliminate errors

due to bad selection of the stock for feeding off, or bad judgment in using them, and would raise the experiments above temporary fluctuations in the markets. Several seasons' work will require to be done before reliable data can be secured for finally fixing the standard values of the respective forages, and in fixing such values the class of sheep employed would be those which would be chosen in practice for that particular forage. For the present, the method followed is to weigh a given number of sheep on and off the plots when the forage is considered to be at the most suitable stage for feeding. Of course, to get reliable comparisons, sheep of uniform age and quality should be used throughout the tests. It is not always possible, in the ordinary working of a farm, to secure sufficient sheep of such a character. If each of the forages were available simultaneously, fairly accurate comparisons could be obtained of the relative values of the crop, but this rarely happens in practice. In feeding off the plots, as many sheep are turned on the plots as will properly utilize the fodder, and the individual increase in live weight is noted. For every increase of 1 lb. live weight 1½d. may be allowed, and an allowance of 1½d. per head per week for the wool irrespective of the increase in live weight. Thus, comparative values for the season of each of the forage crops are obtained, and these values are set against the added cost of producing the wheat crop.



View of Green Manurial and Forage Tests (Section 8), showing method of feeding off barley and rape plots in small sections.

The following tables summarize the data obtained, Table III. giving the sheep-carrying capacity of the respective plots, the live weight increases, the mutton and wool values, and the total value of the crop, whilst Table IV. gives the weight and composition of the crop.

The pease plot did not turn out as well as might have been expected. The pease were not ready for feeding off till 6th November, by which time the whole of the sheep available were in fairly good condition. On the other hand, the rape, barley, rye, and vetches were ready for feeding off for the first time on 1st August, and suitable store sheep were then plentiful. For this reason, the sheep did not give such increases on the pease, as on the remaining forages.

TABLE III.

GRAZING CAPACITY, INCREASES OF LIVE WEIGHT, AND ESTIMATED VALUES OF FORAGE PLOTS, 1913.

Plot.	Size of Plot.	Number of Sheep on Plot	Days on Plot.	Weight of Sheep On.	Weight of Sheep Off.	Increase of Live Weight per plot.	Increase of Live Weight per acre.	Value of Increase, at 1½d. per lb.	Value of Wool, at 1½d. per head per week.	Total Value of Crop per acre.
	acre.			lbs.	lbs.	lbs.	lbs.	£ s. d.	£ s. d.	£ s. d.
6. Rape—										
1st Feed ..	¼	10	48	841½	968	126½	..	..	..	..
2nd Feed ..	..	20	13	1,960	2,075	115	483	3 0 4	1 7 6	4 7 10
Barley—										
1st Feed ..	¼	20	42	1,511	1,733	222	..	..	..	..
2nd Feed	..	20	14	2,187	2,160½	–27	390	2 8 9	2 0 0	4 8 9
Rye and Vetches—										
1st Feed ..	¼	15	48	1,076½	1,208	131½	..	..	..	..
2nd Feed ..	..	10	14	823	864	41	..	..	..	..
3rd Feed ..	..	10	20	1,050	1,090	40	425	2 13 1	1 18 9	4 11 10
9. Pease	¼	20	14	2,075	2,126	51	162	0 12 9	0 10 0	1 2 9

Table IV. summarizes the weight of green forage per acre at first feeding off, and the chemical composition of the green forage:—

TABLE IV.

WEIGHT AND COMPOSITION OF GREEN CROP (FIRST FEEDING OFF, 1913).

Plot.	Weight Green per acre. (First Feeding Off.)		Percentage Composition of Crop.								
			Moisture.	Ash.	Proteids.	Crude Fibre.	Nitrogen Free Extract.	Ether Extract.	Albuminoid Nitrogen.	Amide Nitrogen.	Total Nitrogen.
	tons	cwts.									
6. Rape	10	5	86·51	1·58	3·05	1·25	6·89	·72	·333	·155	·488
7. Cape Barley	12	8	81·03	1·36	2·21	4·15	10·50	·75	·241	·113	·354
8. Pease .. .	7	0	68·55	2·43	5·65	5·75	16·84	·78	..	..	·904
9. Rye and Vetches ..	10	16	84·64	1·88	3·71	2·98	6·44	·35	·394	·200	·594

(*To be continued.*)

YEAST FOR HORSES.

Experiments have been made in Austria with the object of ascertaining if yeast can replace oats in the ration for horses.

It appears that by replacing half of the rations of oats by yeast, all the nutritious elements, with the exception of fat, were better utilized than with the full ration of oats. The substitution of the whole ration of oats by yeast had the consequence that besides fat, crude fibre also was less utilized. The effect of yeast was better when half the oat

ration was substituted than when the whole was replaced. In both cases, however, the utilization quotient stood higher than with the full ration of oats. Feeding on yeast caused no change in the droppings.

It is concluded from the experiments that in practice it is possible to replace with success at least a part of the oats by yeast.—*Fertilisers*, 24th January, 1914.

STANDARD TEST COWS.

Order of Merit—First Year 1912-13.

(Government Standard—Cows 200 lbs., Heifers 150 lbs. Butter Fat.)

COWS. 9 Months (273 days) Test.

Jerseys	20
Ayrshires	11
Red Polls	3
Total competing ..	34

Order of Merit.	Name and Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
				lbs.		lbs.	lbs.
1st	Silvermine IV. (716)	C. Gordon Lyon	Jersey	7,592	5·12	388	443¾
2nd	Wilful Venture	P. E. Keam ..	,,	6,381	5·95	379¾	433
3rd	Lassie (509)	C. Gordon Lyon	,,	7,340	5·08	372¾	425
4th	Molly II. (614)	C. Gordon Lyon	,,	7,440	4·85	361	411¾
5th	Lassie II. (1136)	C. Gordon Lyon	,,	6,650	4·9	326¼	372
6th	Rose of Yalart (1659)	F. J. Stansmore	Ayrshire	7,573	4·12	311¼	355¼
7th	Graceful Magnet of Springhurst (2058)	J. D. Read ..	Jersey	5,887	5·13	302	344
8th	Rose of Lake View (2727)	F. J. Stansmore	Ayrshire	7,266	4·14	301½	343¾
9th	Lady II. (2158)	P. E. Keam ..	Jersey	7,019	4·24	298	339
10th	Dulcie of Springhurst (1878) ..	J. D. Read ..	,,	5,276	5·53	291¾	332¾
11th	Ida of Yalart (2717)	F. J. Stansmore	Ayrshire	5,968	4·88	291¼	332¼
12th	Beauty of Springhurst (1567) ..	J. D. Read ..	Jersey	5,388	5·27	283½	323¼
13th	Cigarette	Department of Agriculture	Red Poll	6,813	4·09	278¼	317¾
14th	Red Lass of Caulfield (2726) ..	F. J. Stansmore	Ayrshire	6,215	4·32	268¾	306¼
15th	Stockings of Springhurst (2663) ..	J. D. Read ..	Jersey	5,047	5·27	266	303½
16th	Silvermine V. (1386)	C. Gordon Lyon	,,	5,645	4·66	263	300
17th	Kathleen II. (1104)	C. Gordon Lyon	,,	5,452	4·75	258¼	294¼
18th	Dimple of Caulfield (2715)	F. J. Stansmore	Ayrshire	4,524	5·69	257½	293½
19th	Aster of Springhurst (1540) ..	J. D. Read ..	Jersey	4,921	5·17	254¼	290¼
20th	Euroa of Springhurst (1918) ..	J. D. Read ..	,,	5,007	5·08	254½	290
21st	Havana	Department of Agriculture	Red Poll	6,060	4·17	253	288¼
22nd	Audrey Lassie (825)	C. Gordon Lyon	Jersey	4,854	5·2	252¼	287¾
23rd	May II. (568)	C. Gordon Lyon	,,	5,066	4·95	250¾	286
24th	Alsyke of Springhurst (1515) ..	J. D. Read ..	,,	4,837	5·17	250½	285¾
25th	Berylan (2714)	F. J. Stansmore	Ayrshire	5,174	4·78	247¼	282½
26th	Princess II.	P. E. Keam ..	Jersey	5.783	4·27	246½	281
27th	Lady Ada Douglas (2387)	F. J. Stansmore	Ayrshire	5,293	4·61	244¼	278¼
28th	Jersey Maid (2114)	P. E. Keam ..	Jersey	4,122½	5·58	230	262½
29th	Nice of Caulfield (2722)	F. J. Stansmore	Ayrshire	4,886	4·69	229½	261¾
30th	Princess Edith of Oakvale (2725) ..	F. J. Stansmore	,,	5,922	3·8	225	256½
31st	Lily II. of Oakvale (2720)	F. J. Stansmore	,,	5,403	4·00	216¼	246¾
32nd	Pennsylvania	Department of Agriculture	Red Poll	4,979	4·32	215	245¼
33rd	Julia of Yalart (2718)	F. J. Stansmore	Ayrshire	4,417	4·74	209½	238¼
34th	Fancy of Glenard (1939)	P. E. Keam ..	Jersey	3,419	6·05	206	235

HEIFERS. 9 Months (273 days) Test.

Ayrshires	.. ..	7
Jerseys	.. ..	3
Red Poll	.. ..	1
Total competing	..	11

Order of Merit.	*Name and Herd Book No.*	*Owner.*	*Breed.*	*Milk.*	*Average Test.*	*Butter Fat.*	*Butter.*
				lbs.		lbs.	lbs.
1st	Tulip of Springhurst (2730).. ..	J. D. Read ..	Jersey	4,550	5·63	256¼	292
2nd	India	Department of Agriculture	Red Poll	5,231	4·55	238¼	271½
3rd	Daphne of Springhurst (1803) ..	J. D. Read ..	Jersey	3,917	5·75	225¾	257
4th	Olive	P. E. Keam ..	„	3,962	5·66	224½	256
5th	*Peggy of Yalart (2724)*	*F. J. Stansmore*	*Ayrshire*	4,659	4·53	211	240¾
6th	Amy of Yalart (2603)	F. J. Stansmore	„	4,583	4·4	201½	229¾
7th	*Leonora of Yalart (2719)*	F. J. Stansmore	„	5,064	3·79	192	218½
8th	Fury of Yalart (2716)	F. J. Stansmore	„	4,082	4·56	186¼	212¼
9th	Lydia of Yalart (2721)	F. J. Stansmore	„	4,169	3·9	162¾	185½
10th	Roxana of Yalart (2604)	F. J. Stansmore	..	3,747	4·3	161¼	184
11th	Optic of Yalart (2723)	F. J. Stansmore	..	3,632	4·43	161	183½

REPORT FOR QUARTER ENDING 31st MARCH, 1914.

Since last quarterly report the following cows have completed their term of 273 days under the regulation. A number of others have successfully completed their lactation period, but owing to delay on the part of owners they have not been entered in their respective herd books, consequently they are not included in this return. The regulations provide that only herd book cows will be tested, but as some time is necessary to complete an entry it has been the policy to commence the testing of any cows which are apparently eligible, thus leaving the owners further time to make the necessary application without losing the test for a season. It is to be regretted that advantage of the facilities to owners has not been taken, for the returns cannot be completed nor certificates issued until registration has been effected, and owners thus loose the advantages of the publication of the returns.

RETURN OF CERTIFICATED COWS FOR QUARTER ENDING 31st MARCH, 1914.

MRS. B. M. BECKWITH, Malvern. (Dexter Kerry).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Colleen	*	21.6.13	28.6.13	273	10¼	4,363	4·67	203¾	175	232¼

* Not yet allotted.

W. P. BRISBANE, Weerite. (Ayrshire).

Completed since last report, 11. Certificated, 11.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Dolly Varden of Gowrie Park	2418	1.4.13	8.4.13	273	5½	8,222½	4·46	366¾	250	418¼
Quaily of Gowrie Park	*2431*	*3.4.13*	*10.4.13*	*273*	*10½*	*7,008*	*3.94*	*276*	*250*	*314¾*
Little Favourite of Gowrie Park	701	5.4.13	12.4.13	273	2	7,590	3·77	286½	250	326¾
*Brown Queen of Gowrie Park	2412	8.4.13	15.4.13	273	10	7,054	4·04	321¾	250	366¾
Ruby Lass of Gowrie Park	2433	14.4.13	21.4.13	273	7¾	7,355½	4·26	313¼	250	357
Patch of Gowrie Park	2430	26.4.13	3.5.13	256	½	7,032¼	4.64	326¼	250	371¾
Honey of Gowrie Park	2422	12.5.13	19.5.13	273	8¼	10,798¼	3.92	423¼	250	482½
Aimie of Gowrie Park	2408	5.5.13	12.5.13	266	¾	6,405½	4·99	320	250	364¾
Gladys of Gowrie Park	2421	9.5.13	16.5.13	273	1¼	6,340½	4·39	278½	175	317½
Trixie of Gowrie Park	2434	10.5.13	17.5.13	273	4	8,151½	4·29	350	250	399
Fairy of Gowrie Park	1707	5.6.13	12.6.13	273	4½	5,912¾	4·45	263¼	250	300¼

*Sore foot caused protracted lameness affecting yield.

GEELONG HARBOR TRUST. (Ayrshire).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Frolic of Glen Elgin..	1817	30.5.13	6.6.13	273	3½	5,656½	4·46	252½	250	288

DEPARTMENT OF AGRICULTURE. (Red Poll).

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Atlanta	*	29.5.13	5.6.13	273	16½	5,200¼	4·88	254	200	289½
Sumatra	*	19.6.13	26.6.13	273	16½	7,005	4·18	293	250	334

* Not yet allotted

To disc after harvest, to harrow after rain, to plough deeply, and in the autumn, if possible, to have the land in the best condition to catch all winter rains; to sow selected seed and acclimated seed, to cultivate and cultivate again, to know the soil as a merchant knows his stock-room—these are points which make for success in the dry country.—*Official Bulletin of the International Dry-farming Congress.*

BEE-KEEPING IN VICTORIA.

(Continued from page 209.)

F. R. Beuhne, Bee Expert.

XXIII.—BEES AND THE FERTILIZATION OF FLOWERS.

To the apiarist who follows bee-keeping for his living, as well as to he amateur who pursues it as a hobby, the better recognition, in recent rears, of the bee as an important factor in fruit-growing and seed aising is very gratifying, because as fruit-growers and gardeners become bee-keepers to the extent necessary to success in their occupations, they acquire a knowledge of the habits of the bee, from personal observations, which will do much to remove the last of an antagonism which at one time was very pronounced.

Without going into the subject of bees and ripe fruit, I wish to tate emphatically that bees do not injure sound fruit, but will, under he stress of a dearth of nectar, collect the juices of fruit damaged by ain, birds, and insects other than bees. This fact has been proved by numerous experiments in all countries, and by the experience of ruit-growing bee-keepers, and the opinion still held by a few that bees do attack sound fruit is based on superficial observation, the cracks or fine punctures of the skin of fruit escaping notice.

RELATION OF THE BEE TO POLLINATION OF BLOSSOMS.

There can be no doubt that insects play a most important part in he life of plants and flowers. Moths and wasps, bees, and many other nsects, all assist in carrying the pollen from flower to flower; but of ll insects for this purpose the bee is assuredly the most useful. The irst object the bee has in visiting a blossom is to collect either nectar r pollen. The nectar is always lower in the flower than the pistil or tamens. In passing through the flower the pollen grains attach themelves to the numerous hairs on the body of the bee, and as the insect ies from flower to flower some of the pollen grains are transferred as he bee brushes against the stigma. The same result occurs when the ee is gathering pollen, a substance which is absolutely necessary to the xistence of bee life, as not a single young bee can be reared without ollen.

The usefulness and the importance of this work of the bee can ardly be over-estimated, and successful orchard practice will never esult until the work of the bee is recognised practically by the establishment or the temporary locating of bee colonies in or near every orchard.

The failure of fruit blossoms to become pollinated occurs chiefly in arly spring and during bad weather. To insure as far as possible the ollination of fruit blossoms under these adverse conditions, it is necesary that the hives of bees should be near the flowering trees, that the ees should be of a race or strain which commences brood-rearing early spring, so that the gathering of pollen for the needs of the brood carried on even on cloudy and cold days. As black bees are less ensitive to cold and rain, and commence breeding earlier than Italian ees, the first-named and its crosses with the Italian bee will be found ore suitable for the fertilization of early blooms.

CONDITION OF BEE COLONIES AN IMPORTANT FACTOR.

The pollen of flowers is used by bees in the preparation of the food of the young bee larvæ, but is not required by adult bees for their own sustenance, which during inactivity consists entirely of honey; further, the time at which brood-rearing commences in spring is, apart from the factor of race, governed by the number of bees a hive contains and the amount of honey present. The stronger a colony is in bees and the richer in stores of honey, the earlier it will start brood-rearing, because considerable numbers clustered together are necessary to produce sufficient animal heat to enable them to rear brood at a time when the temperature is low, and even a large colony will, on the other hand, not start breeding early when short of stored honey. Honey is a good non-conductor of heat, and therefore protects the bees against the influence of the temperature outside the hive, and prevents the loss of animal heat created by the cluster of bees, and absolutely necessary to the rearing of brood. It must also be remembered that the first forage trips of bees early in the season are in search of pollen, not of nectar, and that a colony weak in numbers or short of stores cannot breed early, and does not require pollen. For the purpose of fertilizing early blossoms a strong colony of bees, well supplied with honey of the previous season's gathering, is therefore more effective than a number of weak or half-starved stocks.

DISTANCE OF HIVES FROM TREES AND NUMBER OF HIVES NECESSARY.

The distance to which bees will fly in search of pollen and nectar varies with the season and the weather at time of fruit blossom. On warm sunny days bees will go a mile or more, even in early spring. On cold and cloudy days they do not venture far, and during short snatches of sunshine would probably not visit flowers more than 100 yards distant, if there is no blossom nearer to lead them on.

The bee is guided to the blossom by the sense of smell. When the air current is from the hive to the tree the blossom may not be visited, even though comparatively near, unless the weather is favorable enough for the bee to undertake a circular reconnoitring flight, during which the scent of blossoms is picked up and followed to its source. Whatever may be the guiding sense in the case of other insects, I am convinced that, with the bee, it is that of smell. I have never succeeded in inducing bees to come near artificial flowers which easily deceived the human eye, but can always rely on them finding a drop of honey placed somewhere out of sight.

When bees are kept in or near the orchard the ordinary cleaning flights which bees undertake in spring, whenever atmospheric conditions permit, will bring the blossom within range, but when located half-a-mile away bees cannot be counted on as fertilizers during unfavorable weather. As regards location of the hives, I think that they are best placed in a sheltered position where they are shaded in summer, but have the full benefit of the sunshine in winter and spring. This is more easily accomplished by putting them under trees which shed their leaves.

Observations made in the United States in recent years showed that the nearer the bees were to the trees the better was the crop of fruit.

There are as yet no data available as to the number of hives required to fertilize the blossoms of a given number of trees under various weather conditions. Naturally a smaller number is sufficient during fine weather. It is certain that the more bees are kept the better the

results. There is, however, a limitation to the number of colonies a fruit-grower can keep permanently in his orchard, as the amount of bee food within the range of the bees' flight during the remainder of the year must be sufficient to maintain them, and to provide winter stores.

The value of bees in the orchard is now so well recognised in the United States that in many instances where fruit-growers have none or not sufficient bees of their own they practically hire bees from bee-keepers for the fruit bloom, providing standing room for the hives in the orchard, and doing the carting of the bees to and from the orchard.

It is, however, not in the orchard alone that bees are of the greatest importance to agriculture, but also in the production of small fruits and farm crops. Dr. Phillips, of the United States Department of Agriculture, estimates the annual value of bees for the fertilization of flowers in the United States at many million dollars, apart from the production of honey and beeswax.

Fig. 1.—Bees in the Orchard.

Where cucumbers, melons, and similar plants are cultivated on a large scale, it has been found necessary to establish apiaries, as the number of bees and other insects present was insufficient to effect the pollination of the blossoms. Where early cucumbers are raised under glass, hives of bees are located in the green-houses, and the labour of transferring the pollen from the male to the female blossoms is thus saved. At Cape Cod, in Massachusetts, hundreds of acres of cranberries are grown. It was discovered, according to Mr. E. R. Root, who paid a visit to the locality (Gleanings in Bee Culture, 15th July, 1913) that the yield per acre could be enormously increased by having bees within convenient access Formerly wild bees in the locality had been sufficient to do the work of pollination for the cranberries. The United Cape Cod Cranberry Company has something like 700 acres of cranberries, which it is proposed to increase to 2,000. On one side of

one lot of 126 acres there were three or four colonies of bees. It was evident that this number was inadequate to cover the whole field. It was very significant that the yield per acre of berries was in direct proportion to the proximity of such acreage to the bees. The yield was heaviest close to the hives, and was thinner and thinner as the distance from the hives increased. The showing was so remarkable that the company proposes to increase materially their investment in bees. What the company wants is cranberries, honey being only a secondary consideration.

BEES AND THE SPRAYING OF FRUIT TREES.

It is an accepted fact that the bee is the most useful of all insects in conveying pollen from flower to flower for fertilization purposes. It is also known that to exclude bees and other insects from the blossoms is sure to result in a considerably reduced crop of fruit. It has been frequently stated, especially in publications dealing exclusively with the honey bee, that spraying fruit trees while in bloom will cause great mortality amongst the bees. As the spraying of fruit trees is compulsory, it would appear to be a great anomaly that orchardists should destroy the bee, their best friend, by spraying the trees when in full blossom, when spraying before the blossoms are open or after the petals have dropped is said to be more effective and then harmless to bees. In the United States much damage appears to be done to bees by spraying while the trees are in bloom, and legislation is proposed to put a stop to the practice. The reports as to the destruction of bees seem to be well vouched for. Professor H. A. Surface, in reply to the question, "What kind of spray is best to use when peach trees are in bloom?" gives an emphatic answer as follows:—"I note with interest that you make inquiry concerning the kind of spray to use while the trees are in bloom. Again I hasten to say that you are decidedly wrong. Please get it out of your head now and for ever, for your own sake and that of your crop as well as for the bees, that no trees, shrubs, bushes, or vines of any kind should ever be sprayed while in bloom."

With the object of arriving at some definite conclusions as to in how far American experience applied to Victoria, observations were made in the orchard of the Horticultural School at Burnley by Mr. E. E. Pescott, the principal, in conjunction with the writer. The results of the first season's observations were recorded in an article, "Bees and Spraying," published in the *Journal of Agriculture* for January, 1912, from which I extract the following:—

It is often considered that bees are able to collect a good store of honey from fruit tree blossom, and that the yield of fruit tree honey comes at a time when the bees urgently need it for brood-rearing. That may be so in other countries, but it does not appear to be so in Australia. Here, the nectar flow seems to be somewhat weak, and insufficient in quantity for the necessities of the bees. A Victorian apiarist during the past season removed his bee colonies from his home to a district where the bees had an available range over 15,000 fruit trees. He ultimately found that the bees were starving, and he had to remove them to a more suitable locality. It may thus be found that the chief use of bees in the orchard will be for cross-fertilization purposes.

Whenever losses of bees occur in apiaries located in or near orchards in which spraying is practised, the owners assume that the mortality is due to the poisons used in the spraying mixtures. So far, there appears to be no proof that bees gather poison along with nectar and pollen, nor is there any instance on record of the poisons having been proved, by analysis, to be present in dead bees, bee larvæ, pollen, or honey.

Dead bees may often be found not only on the blossoms of fruit trees which were not sprayed, but also on acacia and other flowers blossoming at the same time. Heavy losses of bees from unknown causes occasionally occur at the time of fruit bloom in localities where there are no fruit trees at all, while, on the other hand, apiaries located close to orchards in which the trees were sprayed repeatedly, suffered no perceptible loss and were in a thriving condition. Again, bees might not be affected by the amount of poison gathered with the

A portion of the Burnley Apiary, showing hives under fruit trees.

nectar, but it might be sufficient to kill the brood. In an independent experiment made last season, iron sulphate, 1 part in 400 of sugar syrup, was quite harmless to bees, but killed all the brood.

At the Burnley orchards, there are altogether over 1,800 varieties of fruit trees, which bloom at various times—from the end of August to the beginning of November. Hence, the trees, particularly the apple and pear trees, must be sprayed at a time when some of them are in bloom, with both Bordeaux mixture and arsenate of lead. And this occurs every season.

During last year, the pear trees were sprayed with Bordeaux mixture when some were in blossom; while, later on, a number of apple trees were sprayed with lead arsenate when in bloom. Under these circumstances it was decided to make observations in order to establish reliable

At the Burnley apiary, the bee hives are right under the fruit trees, and at the time of spraying with Bordeaux mixture the ground had not yet been ploughed, so that the spray fell not only on any fruit blossoms which were open, but also on the Cape weed then abundantly in bloom.

Neither the spraying with Bordeaux mixture nor the subsequent one with arsenate of lead had any effect whatever upon the bees, the colonies developing normally and without any check; there was not at any time dead brood in the hives. There is no doubt that under the atmospheric conditions prevailing at the time the spraying of the trees proved quite harmless to bees.

The apiary at the Burnley Horticultural Gardens was established before the 1911 fruit bloom to which the report quoted refers. Since then observations have been continued extending over two additional seasons, and although atmospheric conditions were somewhat different the results are identically the same. There were no dead bees and no dead brood with the single exception of a few dead larvæ in one hive into which, owing to its backward tilt, a quantity of the arsenate of lead mixture (about a fluid ounce) had entered; the spraying being exceptionally heavy and the floor of the hive projecting several inches beyond the hive body. The liquid had, perhaps to a slight extent, been used instead of water. Diligent search failed to find more than five or six dead larvæ.

Requests made during two season's lectures on bee-keeping for authentic information as to the poisoning of bees by spraying and for bees which died of the poison have elicited no response, and so far as this State is concerned not a single case of poisoning by spraying has been proved up to the present.

(*To be continued.*)

FLAX GROWING.

Writing on manuring, Dr. Vargas Eyre (reporting to the Development Commissioners, Great Britain) remarks that flax has been clearly shown to be a potash feeding plant, requiring a good supply of this food material for its rapid assimilation. An analysis of the straw shows that potash and lime are its chief mineral constituents, a fact which partly explains why this crop grows so much better on the new "Polder" land in Holland than it does on the old, there being more lime and potash in the soil recently reclaimed from the sea. Nitrates are sometimes useful in bringing along a backward crop, but great care has to be exercised in their use, because of a tendency to cause weakness in the fibre and a weak crop generally. Besides causing unevenness, stable manure is universally condemned, because it induces a large growth of foliage and woody material without any equivalent increase of fibre; it is also stated on good authority that the fibre borne by such plants, besides being present in small amount is decidedly coarser and of less value. Except in certain cases, a similar evil attends the use of phosphates, with the additional disadvantage of an enhanced crop of weeds on the field.—*Fertilisers*, 24th January, 1914.

VARIETY WHEAT TESTS.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

During the past year a number of varieties of wheat were tested at Werribee, Rutherglen, Longerenong, and Wyuna, with the object of finding out the varieties which did best in each of the climatically different districts represented by these four centres.

At Werribee and Rutherglen the tests were made in blocks ranging from 5 to 10 acres of each variety, whilst at Wyuna and Longerenong the plots were ½ acre in area.

The actual rainfall from the day the seed was sown till harvest at these centres was as follows:—

Werribee . .	7.80 inches.
Wyuna	8.73 ,,
Rutherglen	10.35 ,,
Longerenong	11.18 ,,

The least rainfall during the growing period was at Werribee, amounting to 7.80 inches, whilst the normal rainfall for the period, May to December, is 13.1 inches.

The following table summarizes the yields:—

TABLE I.—YIELDS OF WHEAT VARIETIES AT RUTHERGLEN, WERRIBEE, WYUNA, AND LONGERENONG.

Name of Variety.	Rutherglen (Bulk Field.) (5–10 acre blocks.)	Werribee. (Bulk Field.) (5–10 acre blocks.)	Wyuna. Half-acre plots.	Longerenong. Half-acre plots.
	Bushels.	Bushels.	Bushels.	Bushels.
College Eclipse . . .	32·4	21·8	20·1	30·1
Yandilla King . . .	32·4	18·5	. .	23·4
Viking	30·0	17·5	. .	27·3
Marshall's No. 3 . . .	29·0	22·1	. .	17·5
Improved Dart's	28·8	24·6	21·6	17·4
King's Early . . .	27·3	22·2	20·7	22·6
Federation	27·9	15·1	20·1	25·2
Bayah	28·2	17·6	17·9	23·4
American 8	26·7	18·1	21·9	17·5
Gluyas	26·7	22·5	18·8	21·0
Penny	26·3	16·2	18·2	. .
Bunyip	23·7	9·9	16·4	27·9
Firbank	23·4	. .	11·4	22·7

The characteristics of these varieties have already been described in the *Journal* (*vide* March, 1913).

The returns from the Werribee plots were vitiated by a severe hailstorm on 12th November, which did considerable damage to all varieties. Firbank was practically destroyed, whilst Bunyip, Federation, Viking, and College Eclipse, which were beginning to ripen, suffered considerably. The estimated damage of these varieties ranged from 10 to 50 per cent.

The results are of interest, as they demonstrate that at each centre there are several varieties that have, during the past season, proved superior to Federation, which may be regarded as a standard of prolificacy. It is a matter of interest, too, to note that several of the varieties that have done well, *e.g.*, College Eclipse, Viking, and King's Early are early maturing types, and are likely to do well in the drier districts where lateness in maturity often proves disastrous when spring rains fail.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley

The Orchard.

Cultivation

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. The autumn ploughing may be as rough as possible, taking care to plough *to* the trees, so that the drainage furrow is left between the rows.

Manuring.

It is just probable, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well cultivated and thoroughly tilled land will always carry fair crops, and with far less manure than otherwise. Also, if the orchard land is well and thoroughly drained, cultivated, and subsoiled, any manures that are used will be far more beneficial to the trees. The more suitable conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil, quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that alone can be determined by each circumstance. Orchards in different climates, and on various soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases; while an excess beyond what is necessary for present use, will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical soil condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covering these with a layer of soil, and allowing them to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin Moth. All hiding places, nooks and crannies, wherever the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work, than he will have in the spring-time.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and handweeding must be resorted to, prefera' hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced, and if these can be kept growing, much better crops will result The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is a matter of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying both eggs and insects in immense numbers, that would breed and live in the ground to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should as well be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful humic addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should be well above ground. Where they has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development; and thus the seeds should be sown thinly, or the plants set out at a fair distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

THE VICTORIAN WHEAT HARVEST.

Mr. A. M. Laughton, Government Statist, has issued the following return, showing actual area under crop and yield of wheat for the seasons 1912–13 and 1913–14.

Counties Geographically Arranged.	Area in Acres.		Produce in Bushels.		Average per acre in Bushels.	
	1912–13.	1913–14.	1912–13.	1913–14.	1912–13.	1913–14.
Grant	12,418	10,613	207,918	110,200	16·74	10·38
Talbot	11,973	16,270	196,709	248,872	16·43	15·30
Grenville .	40,443	35,058	789,824	441,964	19·53	12·61
Hampden ..	24,045	22,688	463,289	362,185	19·27	15·96
Ripon	83,636	78,959	1,669,259	1,223,912	19·96	15·50
Lowan	143,314	167,817	1,962,154	2,725,563	13·69	16·24
Borung	274,956	340,497	4,072,629	6,183,257	14·81	18·16
Kara Kara ..	114,260	135,172	1,679,804	2,328,769	14·70	17·23
Weeah	91,188	145,333	914,922	710,369	10·03	4·89
Karkarooc ..	376,389	445,108	2,851,867	2,423,352	7·58	5·44
Tatchera ..	236,672	276,983	1,664,955	2,398,988	7·03	8·66
Gunbower ..	35,888	46,736	378,181	573,205	10·54	12·26
Gladstone ..	100,424	128,797	1,305,528	2,238,428	13·00	17·38
Bendigo ..	117,363	154,551	1,686,702	2,410,296	14·37	15·60
Rodney ..	115,776	145,756	1,600,814	2,150,101	14·60	14·75
Moira	229,836	305,662	3,337,746	4,932,209	14·52	16·14
Delatite ..	11,986	16,438	234,018	203,386	19·52	12·37
Bogong	35,595	54,021	571,526	719,445	16·06	13·32
Remaining Counties	29,054	39,402	545,259	551,754	18·77	14·00
Grain ..	2,085,216	2,565,861	..	..	..	..
Hay	386,370	220,560	..	..	..	..
Total ..	2,471,586	2,786,421	26,223,104	32,936,245	12·58	12·84

NOTE.—The requirements for seed and consumption in 1914 are estimated at 9,000,000 bushels.

THIRD VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1913-14.

The third egg-laying competition was brought to a close on 14th April, 1914, and was the most successful that has yet been conducted.

The winning pen (No. 23, J. H. Gill) established the official world's record of 1,667 for the year, and the eggs were sold at 1s. 2d. a dozen, showing a gross return of £8 2s. for the six birds, or £1 7s. 2d. a bird. Second prize goes to Mr. W. G. Swift, with a score of 1,547; and the third prize (E. H. Bridge), 1,539.

A remarkable feature of the competition (which is another world's record) is the average number of eggs laid by the leading twelve pens, viz., 1,508 per pen.

The winter test (Mr. J. H. Gill, 553) was another world's record.

The return per bird, after deducting cost of food throughout the competition, 378 birds, works out about 15s. per bird.

Mr. T. S. Dallimore won the prize in heavy breeds with his Black Orpingtons, 1,216.

Mr. R. Walsh, Redfern Poultry Yards, wins heaviest average egg, 2.126 ozs.

A full report of the competition will appear in due course.

THIRD EGG-LAYING COMPETITION, BURNLEY.

Results for 11 days, ended 14th April, 1914 (end of Competition).

Pen.	Breed.	Owner.	*Eleven* Days.	*Previous* Total.	*Final* Total.
2	White Leghorns ..	*R. W. Pope*	12	1,337	1,349
3	.. ..	S. Buscumb	4	1,183	1.187
4	.. ..	Jas. Brigden	3	994	997
5	.. ..	G. W. Bobbins	28	1,449	1,477
6	.. ..	J. S. Spotswood	27	1,463	1,490
7	.. ..	*H. McKenzie*	*6*	1,449	1,455
8	.. ..	E. H. Bridge	37	1,502	1,539
9	.. ..	Sylvania Stud Farm	2	944	946
10	.. ..	T. A. Pettigrove	29	1,429	1,458
11	.. ..	C. J. Beatty	22	1,473	1,495
12	.. ..	*A. H. Padman*	*8*	1,274	1,282
13	Black Orpingtons ..	T. S. Dallimore	18	1,198	1,216
14	White Leghorns ..	F. Hannaford	22	1,295	1,317
15	.. ..	J. Shaw	7	920	927
17	R.C. Brown Leg-horns	S. P. Giles	..	1,016	1,016
18	White Leghorns ..	B. Rowlinson	22	1.197	1,219
20	.. ..	C. B. Bertlesmeier	16	1.446	1,462
21	.. ..	A. Ross	21	1,371	1.392
22	.. ..	B. Mitchell	33	1,207	1,240
23	.. ..	J. B. Gill	45	1,622	1,667
24	.. ..	Redfern Poultry Farm	19	1,383	1.402
25	Black Orpingtons ..	King and Watson	20	1,058	1,078
26	White Leghorns ..	B. Rolls	2	1 312	1,314
27	.. ..	J. Sinclair	8	1,196	1,204
28	.. ..	E. Waldron	..	985	985
29	.. ..	S. Brundrett	21	1,227	1,248
30	Black Orpingtons ..	Jas. Ogden	24	1,184	1,208
31	White Leghorns ..	W. G. Swift	43	1,504	1,547
32	.. ..	H. Hanbury	25	1,314	1,339
33	.. ..	South Yan Yean Poultry Farm ..	16	1,334	1,350
34	.. ..	J. E. Bradley	38	1,432	1,470
35	.. ..	Moritz Bros.	16	1,506	1,522
36	.. ..	A. J. Jones	19	1,150	1,169
37	.. ..	A. H. Busst	22	1,270	1,292
38	.. ..	M. A. Monk	..	1,135	1,135
40	.. ..	George Edwards	30	1,407	1,437
41	.. ..	Percy Walker	7	1,281	1,288
42	.. ..	A. Stringer	13	1,180	1,193
43	.. ..	Morgan and Watson	9	1,171	1,180
44	.. ..	W. A. Rennie	15	1,221	1,236
45	.. ..	D. Goudie	15	1,245	1,260
46	Black Orpingtons ..	T. W. Coto	9	1,108	1,117
47	White Leghorns ..	W. McLister	20	1,251	1,271
48	.. ..	Thirkell and Smith	26	1,472	1,498
49	.. ..	M. H. Noye	22	1,366	1,388
50	.. ..	A. H. Mould	32	1,441	1,473
51	Black Spanish ..	W. H. Steer	3	1,125	1,128
52	*White Leghorns* ..	*W. G. Osborne*	*17*	1,274	1,291
53	Black Orpingtons ..	A. Greenhaigh	18	1,085	1,103
54	White Leghorns ..	Jas. McAllan	2	1,085	1,087
55	.. ..	P. H. Killeen	9	1,093	1,102
56	.. ..	Schaefer Bros.	2	1,211	1,213
57	.. ..	*Gleadell Bros.*	*17*	1,223	1,240
58	.. ..	Stranks Bros.	15	1,262	1,277
59	.. ..	Cowan Bros.	7	1,162	1,169
60	Black Spanish ..	Watson and Rushworth	29	1,120	1,149
61	White Leghorns ..	Jno. Campbell	18	1,338	1,356
62	.. ..	*G. A. Gent*	*11*	1,204	1,215
63	.. ..	A. Sellars	14	1,218	1,232
64	Golden Wyandottes	C. L. Sharman	27	1,006	1,033
65	White Leghorns ..	E. A. Lawson	7	1,327	1,334
66	.. ..	W. Featherston	1	1,375	1,376
67	.. ..	*C. Hepburn*	*20*	1,369	1,389
		Total	1,050	79,379	80,429

A. HART,
Chief Poultry Expert.

STATISTICS.

RAINFALL IN VICTORIA.—FIRST QUARTER, 1914.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	January.		February.		March.		Quarter.	
	Total.	Average.	Total.	Average.	Total.	Average.	Total.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	62	110	54	109	105	167	221	386
Fitzroy, Enmerella, and Merri Rivers	86	132	70	178	136	186	292	496
Hopkins River and Mount Emu Creek	79	133	33	127	96	189	208	449
Mount Elephant and Lake Corangamite	97	137	21	123	73	199	191	459
Cape Otway Forest ...	145	195	33	165	104	282	282	642
Moorabool and Barwon Rivers	111	137	25	127	94	199	230	463
Werribee and Saltwater Rivers	116	136	10	146	180	208	306	490
Yarra River and Dandenong Creek	153	214	16	189	236	297	405	700
Koo-wee-rup Swamp ...	203	224	16	163	150	286	369	673
South Gippsland	179	227	17	172	188	315	384	714
Latrobe and Thomson Rivers	239	235	12	169	214	287	465	691
Macallister and Avon Rivers	128	178	7	148	131	210	266	536
Mitchell River	169	258	7	211	148	227	324	696
Tambo and Nicholson Rivers	177	225	8	170	121	288	306	683
Snowy River	176	290	16	219	295	291	487	800
Murray River	86	115	13	117	127	158	226	390
Mitta Mitta and Kiewa Rivers	178	171	8	159	244	299	430	629
Ovens River	175	177	8	157	220	278	403	612
Goulburn River	101	138	6	117	129	178	236	433
Campaspe River	54	111	8	131	131	162	193	404
Loddon River	39	89	7	112	118	128	164	329
Avon and Richardson Rivers	41	64	5	96	75	113	121	273
Avoca River	35	66	7	89	103	123	145	278
Eastern Wimmera	45	75	43	110	51	148	139	333
Western Wimmera	32	59	47	78	72	109	151	246
Mallee District	34	53	44	87	89	95	167	235
The whole State	94	129	25	128	124	181	243	438

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

REMINDERS FOR JUNE.

LIVE STOCK.

Horses.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. Calves should be kept in warm dry shed. Cows and heifers for early autumn calving may be put to the bull.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run. All liquid food should be given warm and feeding utensils kept scrupulously clean.

Sheep.—Lambs, in northern areas, born early from roomy merino ewes, particularly if by Leicesters, are in most years ready at this time for local markets. As a rule, it is good management to send these away when up to 50 lbs. live weight, also any inferior fleeced young ewes that may be in good order, and aged ewes that have missed getting in lamb.

Overgrown hoofs and long toes are conducive to foot-rot. When sheep are yarded trim hoofs into shape; they cut easily in winter.

Do not fail to mark ram lambs as young as possible.

Poultry.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

Farm.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and finish sowing of cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

Orchard.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

Vegetable Garden.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

Flower Garden.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

Vineyard.—Thoroughly prepare for plantation land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see *Journal for April, 1914*. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify

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NITRIFICATION OF ORGANIC MANURES.

By Jno. W. Paterson, B.Sc., Ph.D., Experimentalist, and P. R. Scott, Chemist for Agriculture.

Different Forms of Nitrogen.

Nitrogen exists in soils in several forms. It exists as nitrate nitrogen, as ammonia nitrogen, and as organic nitrogen. The nitrate form is the only one on which ordinary plants will reach their full development. The ammonia form of nitrogen is of importance chiefly because it is more or less easily changed into the nitrate form. The organic form of nitrogen is practically useless to plants.

In all soils by far the greatest bulk of the nitrogen is organic nitrogen. This kind of nitrogen is present in the soil humus, and in the various kinds of animal and vegetable refuse which may be incorporated with the soil.

Production of Nitrates.

For cropping purposes it is the supply of nitrate nitrogen which counts. These nitrates are formed from the soil ammonia, but the rate of this important change is determined by various circumstances. The influence of soil moisture, lime, and various added substances in promoting the nitrification of ammonia were discussed in previous articles.*

Production of Ammonia.

The production of nitrates may, however, be hindered by a lack of ammonia to nitrify. This deficiency may be made good by adding ammonium compounds, *e.g.*, sulphate of ammonia, as manure. There are, however, other, and usually cheaper, ways of adding ammonia to the soil. Bones, dried blood, stubbles, and green manures may be ploughed in. These in the fresh condition do not contain any ammonia, but when they decay their nitrogen present as organic nitrogen is converted into ammonia.

* *Jour. Agric. Vic.* 1912, pp. 275 and 393.

Action of Soil Bacteria.

In previous articles it was seen that the production of nitrates from ammonia was the work of bacteria. The production of ammonia from organic nitrogen is also the work of bacteria. There is, however, a division of labour, and the forms which break up the organic nitrogen compounds with production of ammonia are different from those which complete the changes and yield the finished nitrate. Besides differing in function, these bacteria differ also in form.

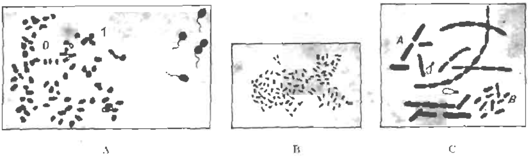


*Fig. 1.—Bacteria which change the nitrogen in soils (highly magnified).

(*a*) *Producing nitrites from ammonia* (Winogradsky).
(*b*) *Producing nitrates from nitrites* (Winogradsky).
(*c*) *Producing ammonia from organic nitrogen*—A. *Bac-mycoides;* B. *Bac-stutzeri (Conn).*

In addition to those illustrated in (*c*), there are a number of other forms capable of producing ammonia in soils.

These different changes, then, are the work of different forms of germ life. It follows from this that the conditions which favour the nitrification of ammonia are not necessarily the same as those which favour the production of ammonia from the organic nitrogenous substances of the soil.

Circumstances Influencing Ammonification.

Some kinds of organic nitrogen are more easily changed into ammonia than others. Farmers are acquainted with the results of this in practice, because some manures act more quickly than others upon crops. The difference may be due to the particular form of chemical combination of the nitrogen as, for example, between bone and peat litter, or between a crop ploughed in green and the same crop after it has matured. Again, a protective coating as of oil may hinder decomposition as seen in the quicker action of steamed than raw bone, and the slow effect obtained from some kinds of fish manure. In all cases fineness of mechanical division is important; fine bone is more active than coarse, and horse manure shows its effect sooner than that of sheep and cattle.

Rate of Ammonification Important.

In producing nitrates from organic manures the formation of ammonia is the first stage. If the first stage is slow, the effect of the manure will also be slow. It seemed desirable, therefore, to carry out some tests with common organic manures, in order to determine the relative speeds at which their nitrogen becomes available for the use

* These illustrations are taken from *Hilgard on Soils*.

of crops. These tests were carried out under varying conditions of soil moisture, as, like nitrification proper, the preliminary production of ammonia would doubtless be influenced by the water supply of the soil.

PLAN OF EXPERIMENTS.

The experiments were conducted in closed bottles in the manner which has previously been described. Soil and manure were intimately mixed, brought up to a known standard of wetness, transferred to a bottle, and the ammonia and nitrate developed on standing were determined by analysis after a known interval of time. The soil used was that denoted as "sandy" in the first article, and chemical and mechanical analyses of this soil have already been given. The 300 grams of dry soil placed in each bottle received 0.75 gram powdered lime carbonate (= .25 per cent.), and to each bottle was added 0.1 gram organic nitrogen. Bottles were numbered from 1 to 6, and the nitrogen was added as follows:—

Number.	Source of Nitrogen.	Per Cent. Nitrogen in Material.
1	No nitrogen ..	—
2	Dried blood ..	11 92
3	Fine bone	3·43
4	Leather	7·33
5	Oat straw	81
6	Lucerne hay ..	2·82

The quantity of material required to supply 0.1 gram nitrogen was calculated from the analysis as stated in the last column. Each of the materials before weighing was passed through a 20-mesh sieve.

WATER CONDITIONS.

Two standards of moisture were employed in different series. In one case water equal to 5.35 per cent. calculated on the dry soil (and equal to 20 per cent. of the water-holding capacity of the soil at the standard volume used in filling the bottles) was given; in the other 16.05 per cent. (equal 60 per cent. of water capacity) was given. The manures were thus each tested under fairly dry, and also under fairly wet, conditions. The bottles, which were placed in a dark cupboard in the laboratory, were corked to prevent evaporation, but were aspirated twice weekly to renew the air. Temperature readings of the cupboard were taken morning and evening.

ANALYTICAL METHODS.

In determining the results, nitrates were estimated by the process which has already been described. For the ammonia estimations, soil equal 25 grams dry soil was heated to boiling in fifteen minutes with 200 c.c. of 9 per cent. sulphuric acid, and an aliquot portion of the extract was distilled with magnesia into $\frac{N}{100}$ sulphuric acid, which was titrated back with $\frac{N}{100}$ soda. Congo red was used as indicator. This

method of extraction was selected after trials of various solvents on prepared soils of known ammonia content, and blank analyses were made with the reagents for purposes of control. The analytical work was performed by Mr. W. C. Robertson, Supervising Analyst, who also supervised the filling of bottles and kept the records.

NUMBER OF TESTS.

Six bottles, five receiving manure, formed a series. Each test was done in duplicate, making twelve bottles. With two degrees of wetness for each manure, twenty-four bottles were required. It was desired to have a complete set for analysis at two different dates, and therefore forty-eight bottles were set up. The results thus give information of the relative availability of five materials under two conditions of wetness, and also after a shorter and longer period of time.

RESULTS WITH DRY SOIL.

Table I. gives the production of nitrates and ammonia under the drier conditions (5.35 per cent. moisture) at the first date of testing. Period of incubation 34 days; average mean temperature 68.5 deg. F.

TABLE I.

—	—	Nitrogen per 1,000,000 Dry Soil.				Percentage of Nitrogen made Available.
		Nitrate.	Ammonia.	"Available."	Excess over No. 1.	
-	At time of filling.	3·10	38·64	41·76	—	—
1	No nitrogen ..	33·43	35·28	68·71	..	..
2	Dried blood ..	172·56	41·30	213·86	145·15	43·54
3	Fine bone ..	182·70	35·28	217·98	149·27	44·78
4	Leather ..	10·36	30·87	41·23	..	..
5	Oat straw ..	1·06	50·30	51·36	..	..
6	Lucerne hay ..	58·42	50·40	108·82	40·11	12·03

In the table, nitrate and ammonia are also stated together as "available" for convenience, although "soon available" would be better, as the ammonia will first be nitrified. The results are the average of duplicates, which agree with tolerable accuracy in every case. The top line of figures denotes the nitrate and ammonia content of the air-dry soil at the time the bottles were set up.

Looking to the figures, it will be seen that those relating to ammonia are much steadier than those for nitrate. This is explained by the fact that ammonia is an intermediate product, and may be changed into nitrate soon after it is produced. The results show that during the period after wetting the soil and filling the bottles, there has been no increase of ammonia in the unmanured soil. This, however, does not indicate that no ammonia was formed from the organic matter of the soil; it indicates rather that the ammonia was being further changed into nitrate at about the same rate at which it was produced.

ACTIVE MANURES.

In the results from the different manures, the bone and blood produced a large increase in nitrates at the end of thirty-four days, showing that a considerable part of their nitrogen had gone through both changes during the time. These manures are thus calculated to benefit crops quickly. Lucerne also shows a nitrate increase, but in a lessor degree, and the increased ammonia from this material shows that its decomposition began more slowly than with the animal manures, that ammonia production precedes nitrification, and that after a longer interval the lucerne is likely to give a considerable increase in nitrates as compared to the unmanured soil.

OTHER MANURES.

Leather was of no use, apparently, in yielding ammonia under the conditions of this test, and, although it permitted a certain amount of nitrification of the ammonia already present, it was worse in this respect than the controls without manure. This result in the relatively dry soil could not be due, as might be surmised, to the absorption of soil water by the leather, because (as will be seen presently) under the wet conditions leather also hindered nitrification as found in the unmanured soil at the start. The oat straw, which is comparatively poor in nitrogen, had to be used in larger quantity than the other manures to supply the 0.1 gram nitrogen, and the excess of organic matter so given has altogether stopped nitrate production. Indeed, it caused the destruction of nitrates already present (denitrification), and this result is in accord with the effect of soluble organic substances upon nitrification noted in a previous article. It appears, however, that while the straw rendered nitrification impossible or futile, it had not the same effect upon ammonification. Indeed, ammonia can be produced when nitrates cannot in presence of excess organic matter. The results from the straw will not, however, apply directly to practice save in cases where very heavy dressings of stable manure are ploughed in, because the amount required for each bottle was certainly excessive.

IN GENERAL.

Generally, the figures indicate that with an organic manure it is the first change into ammonia which presents the difficulty, and will, in ordinary cases, determine the rapidity with which the manure acts. Compared to the first change, the secondary change into nitrates is readily accomplished, and is, relatively speaking, plain sailing. In these circumstances the columns of the table referring to "available" have the greater interest. When, from the figures, the available nitrogen in the controls (No. 1) is deducted, it seems that with bones, also blood, about four-ninths of their nitrogen became "available" in thirty-four days; with finely-divided lucerne the proportion was one-eighth. Leather added nothing, and the oat straw, for reasons stated, failed to give a return.

RESULTS WITH DAMP SOIL.

Table II. gives the results also after thirty-four days, and at the same temperatures under the wetter (16.05 per cent. water) conditions of soil.

TABLE II.

—	—	Nitrogen per 1,000,000 Dry Soil.				Percentage of Nitrogen made Available.
		Nitrate.	Ammonia.	"Available."	Excess over No. 1.	
1	No nitrogen ..	34·92	24·20	59·12	..	..
2	Dried blood ..	184·54	38·63	223·17	164·05	49·21
3	Fine bone ..	160·56	46·34	206·90	147·78	44·33
4	Leather ..	16·40	35·25	51·65	..	..
5	Oat straw ..	·42	40·58	41·0	..	..
6	Lucerne hay ..	71·0	42·84	113·84	54·72	16·41

The results here confirm the conclusions drawn under the drier conditions of soil. Blood, bone, and lucerne each yielded "available" nitrogen in about the same proportions as before, leather was slightly better only than before, while excess of oat straw was worse under the wetter conditions. As between nitrates and ammonia the increase of

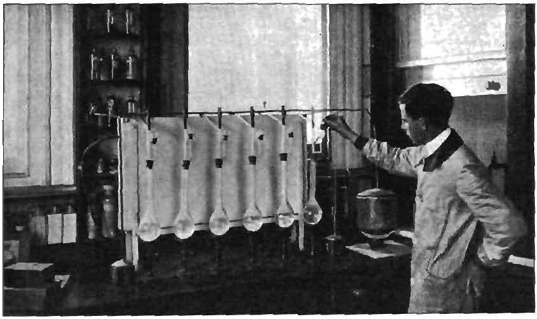


FIG 2.—DETERMINING AMMONIA IN THE SOILS.

water seemed on the whole to benefit nitrate more than ammonia production, both with the control and most of the manure tests, but the figures are too close to base definite conclusions in this matter. It is safe to say, however, that both processes enjoy a long range in the medium degrees of soil wetness, at which they proceed with vigour. Similar conclusions were previously formed in regard to the nitrification process alone where the soil contained sufficient lime.

EFFECT OF LONGER TIME.

These experiments were set up in November, and the analyses quoted were done in December. The remainder of the bottles were left until March, and were then analyzed at the end of 123 days. Table III. gives the results after the longer period and under the drier conditions of soil. Mean temperature during incubation, 70.16 deg. F.

TABLE III.

—	—	Nitrogen per 1,000,000 Dry Soil. Nitrate.	Ammonia.	"Available."	Excess over No. 1.	Percentage of Nitrogen made Available.
1	No nitrogen ..	37·26	22·66	59·92	..	..
2	Dried blood ..	228·22	31·38	259·60	199·68	59·90
3	Fine bone ..	239·71	35·74	275·45	215·53	64·66
4	Leather ..	28·85	14·81	43·66	..	..
5	Oat straw ..	Nil	28·77	28·77	..	..
6	Lucerne hay ..	136·24	24·40	160·64	100·72	30·21

In regard to nitrate, ammonia, and soon "available," the materials stand in the same order as at the end of thirty-four days. On the whole, the ammonia shows a slackening off with a large increase of nitrates in the best cases. The leather has permitted nitrate formation to go forward slowly, but there has apparently been no fresh formation of ammonia, the amount of "available" being similar to that in the drier soil three months previously. From the oat straw there has been further loss of nitrogen, and the total absence of nitrate in these bottles points to denitrification. As a result of repeated aeration during four months these bottles were, however, getting too dry, as the original moisture had fallen from 5.35 to 3.7 per cent.

ANOTHER SET OF CONDITIONS.

Table IV. gives the results, also after 123 days, under the wetter conditions of soil.

TABLE IV.

—	—	Nitrogen per 1,000,000 Dry Soil. Nitrate.	Ammonia.	"Available."	Excess over No. 1.	Percentage of Nitrogen made Available.
1	No nitrogen ..	58·22	30·14	88·36	..	..
2	Dried blood ..	326·97	31·11	358·08	269·72	80·91
3	Fine bone ..	314·76	39·86	354·62	266·26	79·87
4	Leather ..	78·09	14·81	92·90	4·54	1·36
5	Oat straw ..	Nil	26·24	26·24	..	..
6	Lucerne hay ..	236·48	23·33	259·81	171·45	51·43

At the end of the four months the water still amounted to 12.59 per cent., so moisture was sufficient. The manures maintain the same order of superiority as in the former tests.

WHY FRESH APPLICATIONS OF MANURE ACT RAPIDLY.

Comparing the results with those of the wetter series at the earlier period (Table II.), there is in every case a considerable drop in ammonia, with a large increase in nitrate content. Organic manures of any kind contain nitrogen in many complex forms of combination, and,

as the result of decay, the less refractory forms yield ammonia first. When the material lies long in the soil its last nitrogen will be converted very slowly, which is useful in the sense that the humus matters in the soil always contain some nitrogen, although this may be difficult to change to ammonia. It is for this reason that fresh applications of organic matter show a good effect, because, with the better class of materials, a considerable amount of easily convertible material is contained in them. The slackening off of the ammonia seen in Table IV. indicates that the more available part of the organic nitrogen was becoming exhausted, and that, while in Table II. ammonia was being produced faster that it was being taken up to form nitrates; at the later date the conditions were reversed, and ammonia was being produced more slowly. The fact that the daily average production of nitrates was greater during the short than during the long period lends support to this view.

Practical Lessons.

Table V. summarizes the results from the various series. The figures represent the percentage of organic nitrogen from the different manures which was converted into soon "available" forms under the different conditions of soil moisture and after different periods of incubation within the soil.

Table V.

—	—	Dry Soils.		Wet Soils.	
		In 34 Days.	In 123 Days.	In 34 Days.	In 123 Days.
1	No nitrogen	..	..	..	..
2	Dried blood	43·54	59·90	49·21	80·91
3	Fine bone	44·78	64·66	44·33	79·87
4	Leather	..	..	..	1·36
5	Oat straw	..	..	..	..
6	Lucerne hay	12·03	30·21	16·41	51·43

Looking to length of time, it is seen that availability is gradually developed, but more quickly with some materials than others, and the best returns are obtained from the longer period, when the soil is well supplied with moisture.

With blood and bone, four-fifths of their nitrogen became available within four months under suitable conditions of moisture and temperature. These, therefore, are manures which can be applied with confidence so far as the first crop is concerned. Their ready availability shows, however, that little residue will be left for succeeding crops, particularly, of course, when the bone is fine. Lucerne also gave a large increase of nitrates—about 50 per cent. in four months; but it must be recalled that the material was finely divided, so that equally good results would not be obtained in ordinary practice. At the same time, lucerne sweepings will form a cheap and fairly active nitrogenous fertilizer, and, if less active than bone, will act through a longer period. Lucerne will contain more nitrogen than some samples of bone. Leather, in time, under sufficiently moist conditions slowly gives up available nitrogen.

but refuse of this character, also in a lesser degree, horn, hoof, and wool waste, which may form a source of organic nitrogen in animal manures, are in no sense comparable in value to nitrogen from genuine bone. Some of these forms of nitrogen are too slow in yielding nitrates to benefit a first crop. The oat straw results show that while stable manure may be the best of all fertilizers for many purposes, still a heavy dressing may be worse than useless, because the nitrates which it should yield on decomposing are broken up within the soil, so that nitrates for the crop are reduced in amount, or may even be entirely absent.

BONE VERSUS BLOOD.

Bone in these experiments has proved as quickly available as blood. This is a result which might not be repeated on another soil, and, possibly, not on this soil if a little phosphate had been mixed with the manures. Like larger plants, the ammonia-producing bacteria require phosphates as plant food; previous experiments have shown phosphates to favour nitrification, and in a mixture of superphosphate and blood—a common dressing in practice where land is getting run down—the nitrogen of blood will in most cases become available more quickly than will the nitrogen in bone.

SUMMARY.

1. Nitrogen exists in soils and manures in three forms.
2. Nitrate nitrogen is required by plants.
3. Ammonia nitrogen is the raw material for producing nitrates.
4. Organic nitrogen is the raw material for producing ammonia.
5. Bacteria change ammonia into nitrates.
6. Another kind of bacteria change organic nitrogen into ammonia.
7. Animal and vegetable manures contain their nitrogen as organic nitrogen.
8. Their rapidity of action depends, in the first place, upon the rate at which their nitrogen is converted into ammonia.
9. In any case, the change is gradual, and requires time.
10. Lime hastens the change.
11. A sufficient soil moisture hastens the change.
12. The rate of change depends also very largely on the class of manure.
13. Bone and blood may have four-fifths of their nitrogen rendered available in four months.
14. Quickly-acting manures are soonest exhausted.
15. Half the nitrogen in lucerne may be rendered available in four months.
16. Very heavy dressings of fresh stable manure, as in the garden, may be worse than useless by destroying any nitrates present.
17. This danger will be most prominent on land which is fairly wet, and in wet seasons.
18. A moderate dressing of stable manure will yield nitrates gradually, and with good result.
19. Leather, horn, hoofs, and wool waste in mixed manures will show nitrogen on analysis, but they will be slow in action.
20. In purchasing manures of organic origin, it is particularly necessary to know the source from which their nitrogen is derived.

THE STRAWBERRY.

By Edwin Meeking, Orchard Supervisor.

The Strawberry belongs to the natural order of plants, *Rosaceae*, sub-order, *Fragaria* (from Latin *fragrans*, fragrant) in allusion to the strong and pleasant odour of the fruit. The name *Strawberry*, is supposed to have originated from the practice of putting *straw* under the plants to protect the fruit from dirt. Other writers claim that the original name was *Strayberry* in reference to the runners *straying* or trailing along the ground and forming young plants away from the parent one.

HISTORY.

The numerous varieties now grown have originated chiefly from the common Wood Strawberry and the Alpine Strawberry, both belonging to the same species (*Fragaria vesca*). The former grows wild in the woods in the United Kingdom and many parts of Europe. It is also found in North America. It produces abundantly a small, red fruit, rather poor in flavour. The Alpine Strawberry has its home in the mountainous districts of Europe and North America. It is more vigorous in growth than the Wood Strawberry, is very prolific, and bears larger and better fruit than its relative.

Thorough cultivation, liberal manuring, cross fertilization, and careful selection, have evolved the many choice varieties we enjoy to-day.

USES.

The Strawberry is one of the most delicious and wholesome of the small fruits. Consisting almost entirely of matter which is soluble in the stomach, it never undergoes acetous fermentation; consequently it is very nourishing and may safely be eaten in quantity. Its sub-acid juice has a cooling quality, particularly agreeable in the summer, besides possessing the property of dissolving the tartarous incrustations of the teeth, and of promoting perspiration. The free consumption of strawberries is said to be beneficial to persons afflicted with gout. Chemical analysis of this fruit reveals a liberal amount of potash and soda, with a small quantity of iron.

SITE FOR PLANTING AND SUITABLE SOIL.

A gentle slope with a north-easterly, northerly, or north-westerly aspect for early varieties, and a south-easterly, southerly, or south-westerly aspect for late varieties, will be found to give the best results both in quantity and quality.

An ideal soil is a rich dark loam containing plenty of humus and a fair proportion of lime. As a very small portion of the Victorian soil contains lime in an appreciable quantity, this ingredient should be supplied where deficient. The friable reddish soils, heavily charged with ferrous oxide, of many of our hilly districts, such as Red Hill, near Dromana; Wandin, Emerald, and many of the slopes of the Plenty Ranges, have proved very suitable for the production of heavy strawberry crops of good quality and size.

A nice sandy loam of from 10 to 15 inches deep with a friable clay-subsoil, provided the aspect is suitable, will, with the addition of the necessary manure, grow strawberries profitably. In fact, in most of our soils, provided they be sweet and thoroughly drained, and plenty of suitable manure supplied, this delicious fruit will thrive. Many of the small settlers in the irrigation areas of the north and north-east are cultivating it with much success. The accompanying illustration shows portion of the strawberry-plots on the property of C. H. Laurissen, Esq., "Glenburnie," Red Hill. The soil is red and friable, characteristic of that in the greater part of the district. The aspect is westerly. The other portion of the plots is on the opposite side of the slope, the homestead, and an avenue of pines running north and south, occupying the summit of the ridge.

Strawberry Plots of Mr. C. H. Laurissen, "Glenburnie," Red Hill.

PREPARATION OF LAND.

Thoroughly clear off all timber, including roots, from the selected site. In the Spring turn up the soil with the plough to a depth of 6 or 8 inches. This should be allowed to lie fallow till the following Autumn—the time of planting—thereby eliminating all sourness. A system of underground drainage should now be carried out, because, although the life of a strawberry-plot is, to be effective, not more than four or five years, any other succeeding crop will require sub-drainage, and the pipes once laid will be permanent.

The cost of drainage may be considerable, but it will prove one of the wisest and most profitable outlays on the farm. If the cost of an effective system of underground drainage should prove beyond the means of the prospective fruit-grower, the difficulty may be greatly

overcome by cutting out the head lands round the plot with plough and scoop to a depth of 18 inches. The earth removed from this drain can with advantage be spread over the surface of the future strawberry plots.

This work may be left till the Autumn so as not to interfere with the sweetening process going on in the fallowing, and should the clay subsoil occur at a shallower depth than 18 inches, spread only the surface soil over the plots, removing the clay elsewhere.

In the Autumn replough in the same direction as the original ploughing, then cross-plough to the depth of 8 or 9 inches. Afterwards scarify and harrow, reducing the soil to a uniformly fine tilth throughout its whole depth.

Next run at half-chain intervals with the plough a furrow 15 or 18 inches deep, parallel to the fall of the slope, and connecting with the main drain in the bottom headland. This makes each of the lands half-a-chain wide, and insures effective drainage. The idea of the big drain in the headland on the upper side of the plot is to intercept the soakage from that part of the slope above, and to carry it clean away by discharging into the main drains on the sides. The plot is now ready for planting.

PLANTING.

Obtain healthy young plants well rooted. The parent plant from which the runners are selected should indicate that they are of good bearing character of fruit of fine texture and flavour. The strawberry grower, as a rule, is too indifferent to the advantages of selection, and promiscuously chooses his "runners" with a view only to their vigour, whereas hereditary influences should be given an opportunity to assert themselves in the same way as in other plants. It is well recognised that the most successful strawberry growers make their selection on the above principle, so that each individual plant will have equal chances under careful and intelligent management to produce profitable crops.

Having first lined out the row make a hole with the spade about 4 inches deep and 6 inches in diameter. Put in the plant and place the roots in an almost horizontal position, first having pruned the roots to within about 2 or 3 inches of the stem. The spreading of the roots can be effected by holding the plant with the thumb on the crown and spreading them out with the fingers of the same hand, while with the other the soil is pressed tightly in around them. If the soil is dry it will be necessary to water the plants. Good crowned and vigorously rooted plants should be selected. Small leaved weaklings with poor root system should be discarded. It must be remembered that on the accumulated returns of each individual plant depend the growers profits, so that too much care cannot be bestowed on the planting. Cover up to the base of the lowest leaf. Place the plants about 9 inches apart in the rows, and the rows themselves 3 feet apart, sufficiently wide to allow of the cultivator being effectively and easily worked between them. The distance apart depends on the variety. Large crowned varieties may require 18 inches in some districts, but the general practice is to give the space above advised.

SUBSEQUENT WORKING.

The horse-hoe should be used as soon as the weeds germinate. Between the plants in the rows hand-hoeing will have to be resorted to, and in this, as well as in all hand hoeing, great care must be taken that too many roots of the young strawberry plants are not cut. Continue this cleaning process whenever necessary. During the first summer after the crop is harvested, the scarifier (Planet Junior, or Syracuse, small size) should be kept going at frequent intervals between the rows. This tends to conserve the moisture in the soil, and prevents evaporation by forming a fine earth mulch. A vigorous root system is also established. The cultivation should be between the rows of berries throughout the summer after the removal of each crop until about the middle of March, when the nights begin to get cool. At this period the plants throw out vigorous surface roots which should not be cut, as this would tend to make the succeeding crop come late. If the soil during Summer has been deeply cultivated and fertilizers added the plants grow and develop, and increased production can be expected. When these surface roots are produced the cultivation should be shallow, and directed mainly to the suppression of weeds. A Dutch hoe made with a narrow blade from an old cross-cut saw can be used for this purpose.

When the runners are showing nip them off, and continue this throughout the season, because they all act as robbers of the parent plant. Where runners are required to form young plants for a fresh plot it is advisable to secure the runner nearest the parent plant. As soon as it has taken root, and before it has extended its stem for the formation of further runners, detach it from the parent and pot it in nice moist earth rich in vegetable mould. Put these pots (small jam-tins will do, provided the bottoms are perforated with holes) in a cool, shady place, giving them sufficient water regularly till planting-time in the Autumn. The practice of many strawberry-growers of allowing the runners to attach to the parent plant till required for planting out, or of even detaching them and leaving them in their original position in the ground throughout the summer, is not to be commended. In the first instance the runner is not as strong as it should be, having been robbed by each later one extending from it, and in the second it is weakened by long exposure to sun and drought. The present summer with its protracted drought furnishes many examples of the truth of this.

FERTILIZERS.

The strawberry is a very gross feeder, and few Victorian growers are sufficiently generous in the application of fertilizers to their strawberry fields.

If the soil is naturally rich in nitrogen or heavy dressings of nitrogenous fertilizers are added abundant crops of large, soft berries are produced. On the other hand phosphoric acid and potash added to the soil in the form of superphosates and sulphate of potash give texture, flavour, and colour to the fruit. If, therefore, a grower is distant from his markets, it will be necessary in order to produce firm and good carrying fruit that he be liberal in applying these fertilizers to his fields.

Four cwt. to six cwt. of superphosphates, two cwt. of nitrate of soda, and three cwt. of sulphate of potash per acre is regarded as a good dressing. These should be applied at the beginning of March and the beginning of September, equal quantities at each dressing. It would probably be preferable to give all the nitrogen at the March dressing, as the nitrogen applied in September will have a softening effect on the fruit of the subsequent crop.

It must be remembered, however, that continual application of fertilizers will eventually render the soil unproductive. Humus must be added by the addition of stable manure, turning in of excessive growths of weeds, &c., that may occur, the cleanings of old drains, and any other supply that may be available. Of course, it is understood that the quantities of fertilizers to be used will be modified by the character of the soil which may be naturally so fertile as not to require half the above quantities.

In addition about ¼ cwt. per acre of sulphate of iron is advisable, thereby restoring to the soil the iron that the plant robs it of, besides acting as a deterrent to root fungi, which is otherwise often fatal to the plant. In red soils such as those of Red Hill, Wandin, and other places, which contain iron freely, this ingredient does not require to be supplied.

(*To be continued.*)

VITICULTURE IN GREECE.

In its issue of 11th December last, *La Revue de Viticulture* (Paris) gives some interesting statistics concerning the Greek wine industry.

The total area under vines is 531,265 acres, of which 345,940 acres are devoted to wine production, and 185,325 acres to currants. The latter produce 150,000 to 170,000 tons of currants, equivalent to from 500,000 to 550,000 tons of fresh grapes, in other words about 3½ to 1; the average yield per acre would thus be well under a ton to the acre of dried currants. Plantation of currant vines has for some years been absolutely prohibited by law in Greece, owing to the over-production and the low prices ruling in the world's markets.

The Greek wine industry seems to be in a more satisfactory condition since further plantation of wine vines is not restricted in any way. The 345,940 acres under wine varieties yield an average annual crop of 55,000,000 gallons of wine, or at the rate of 130 gallons per acre, the bulk of which is consumed locally. The following are the leading types of wine produced:—

1. Dark-coloured astringent wines, mainly used for blending, containing from 18 to 26 per cent. of proof spirit.
2. Dry white wines, consumed locally, and as a rule treated with 2 to 6 per cent. of resin to control fermentation.
3. Ordinary red wines, for local consumption and export.
4. Sweet and liqueur wines (including Muscats), both fortified and unfortified.

PLANE TREE LEAF SCORCH.

Glœosporium nervisequum (Fckl.) Sacc.

C. C. Brittlebank, Vegetable Pathologist.

Specimens of this disease were received from South Australia during the years 1904 and 1911, and subsequently from Camperdown in 1909: but since that time there is no record of the diseased leaves or twigs having been forwarded to the Pathologist's office. However, since the latter date, and especially during the past year, numerous specimens have come to hand, pointing either to the spread of this disease, or to the greater use of plane trees in streets and ornamental planting. The "Leaf-Scorch" disease must not be confused with the wholesale browning of the leaves of plane trees so commonly observed at this period of the year. This disfigurement is caused by hot dry winds, and is due to excessive transpiration, and is in no way connected with any disease caused by fungi.

The fungus causing the "Leaf-Scorch" is generally confined to the leaf and leaf-stalk, attacking the main nerves of the leaf causing discoloration of this and the adjacent leaf-tissue. If a diseased leaf be examined a number of minute pustules will be observed on the under side of the main nerves; these contain the reproductive bodies (Conidia) of the fungus. If the attack is severe the foliage is almost completely destroyed, and the nutrition of the tree is far below normal, the result being weakened and impeded growth. Bad as the above is there is a second phase of the disease caused by the fungus gaining entrance into the axillary buds from whence it passes down the twig, by way of the cambium, to distances varying from a few inches to over 2 feet. Fig. I.

During the following spring the buds on these diseased twigs open and produce leaves which, however, die before they become fully grown; the naked dead twigs remain as unsightly evidence of the attack. Although the twig is dead the fungus therein is alive, and quickly produces the pustules generally in or close to the numerous lenticels, similar to those found upon the leaf, but in far greater numbers. Fig. II.

When dry, warm weather prevails the openings in the pustules covering the reproductive bodies are contracted or nearly closed, but during damp or rainy weather they open and the conidia exude in uncountable numbers; these minute bodies may be carried by wind, rain, birds, or insects to other parts of the tree, and also to trees in the neighbourhood, thus widening the area of infection. If the twigs remain on the tree, and weather conditions are favorable, the fungus continues to pass down within the twig, with the result that the tree is seriously injured.

The fungus obtained from the leaves and twigs forwarded to this office agrees in every particular with *Glœosporium nervisequum* (Fckl.) Sacc. I have not, however, observed the perfect stage. Probably, as in other cases, it is not needed in our genial climate, where there are no very severe or prolonged winter conditions to contend against.

Every effort should be made to control this disease as plane trees have been largely used for street and garden planting in our cities and towns.

All diseased twigs should be removed at a point some considerable distance below the junction of the apparently sound and diseased wood. Fallen leaves should be raked up, and these with the diseased twigs

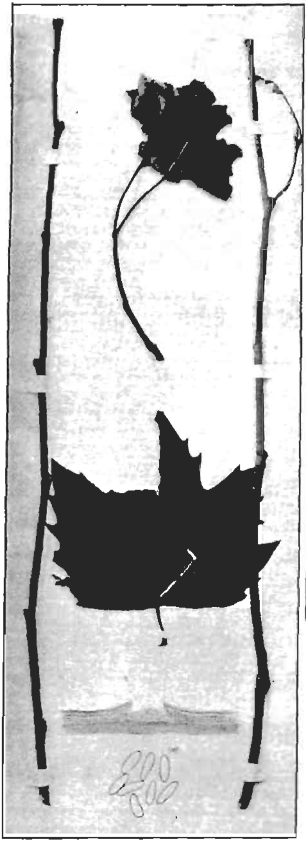


Fig. 1.—Plane Tree Leaf Scorch.

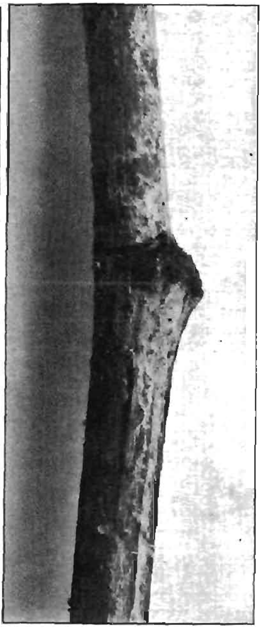


Fig. 2.—Plane Tree Leaf Scorch.

should be destroyed by fire. If the trees are not too large, and it is practicable, they should be sprayed with Bordeaux mixture. In the event of the trees being too large, pollarding can be resorted to. The new growth can then be sprayed, once before the buds open, and again when the leaves are fully out of the bud.

All young trees to be used for street or ornamental purposes should be carefully examined for traces of this disease, and after planting they should be sprayed as directed above.

RUTHERGLEN EXPERIMENT FARM.

SURVEY OF THE COMMONER WEEDS.

G. H. Adcock, F.L.S., Principal.

Before submitting (at the request of the Department) notes on the commoner weeds of this district for the permanent records of the Rutherglen Experiment Farm, it may, perhaps, be advisable to study briefly weeds in general. To define a weed is not so simple as it looks. Very many are the definitions given. It has been describd as "a useless plant"—"a plant that is useless and troublesome." Bailey says it is "a plant that spreads and thrives everywhere." One dictionary describes it as "a plant that grows where it is not wanted, and is either of no use to man or injurious to crops." Another, "any useless or troublesome plant which occurs without intentional cultivation." Percival calls it "a plant whose growth interferes with that of the crops to which the soil for the time being is devoted." Hodge says it is "a plant that persists in growing where it is not wanted." Most definitions give weeds as a class a bad character, and charge them with being useless, troublesome, and injurious interlopers with no very honorable intentions as regards our crops. But there are agricultural authorities who do not thus condemn weeds wholesale. Bailey writes, "They have been an inexorable priesthood, holding us to duty whilst we did not know what duty was, and they still stand ready to extend their paternal offices. . . Weeds have always been the best friends of the farmer They taught him how to till the soil, and they never allow him to forget the lesson. . . . A plant which becomes a weed is only a victor with farm crops, and if the farmer is in command of the vanquished army it speaks ill for his generalship when he is routed."

To the botanist weeds are interesting. Their clever devices for sending their seeds abroad, their impudent aggressiveness, their cool appropriation of the food and space intended for more worthy plants; these and many other qualities render them almost attractive.

The farmer, too, finds they take up a good deal of his time and thought, for, as a learned church dignitary once said, "Agriculture is a controversy with weeds." Before man upset the balance of nature, plants only grew where they were best suited, and there were no weeds. We remove the vegetation nature has taken ages to establish, and introduce for our own purposes plants of greater economic value to us. Any plant that interferes with these specially favoured plants of ours we call a weed. From noxious weeds the losses have been so severe as to necessitate legislation to deal with their eradication. Under the Thistle Act the Governor in Council has power to proclaim any offending plant a thistle. This leads to some confusion. The difficulty might easily be overcome by declaring such plants "noxious weeds." In their original native home, before any artificial alterations were made, no plants were weeds. Introduced—for the most part our weeds are aliens—into out fertile soil and under our genial climate, they thrive amazingly, become aggressive, crowd out native and other herbage, and prove remarkably good colonizers, if not good colonists. Examples support this in the Lantana and Prickly Pear of Queensland, the Stinkwort of South Australia, and the St. John's Wort of Victoria. These are instances of the permanent settling down of these aliens. In the

St. John's Wort we are face to face with, perhaps, our most serious weed problem in Victoria, because, like Tarquin and the Sibylline books, we have treated the subject with indifference.

Where will the hardy invaders not thrive? We find them in abundance along the waysides and inhabiting waste places, where nothing else seems willing to grow. They push their way through the gravelled path and the hard metalled highway. Even in the narrow spaces between the "pitchers" of the municipal drains they obtain a footing. Nature leaves no vacant spaces. If we will not profitably employ the ground, she will plant her weeds. A well-known professor has written charmingly of the botany of a railway station, and described the plants that have established themselves along the platform. But it is, of course, in our arable and pasture lands and gardens that these persistent interlopers find their most congenial location.

Some of the reasons why "Agriculture is a controversy with weeds" lie in the fact that they are decidedly harmful to our crops. Weeds crowd the crop plants and prevent them obtaining adequate supplies of light and air. They rob more desirable plants of space, and by smothering useful plants interfere with their proper development, for by far the larger percentage of the plants' need is obtained from the air. Besides thus crowding, weeds also rob the cultivated plants of the natural and valuable constituents of the soil. They also eagerly assimilate the more costly plant food added to the soil in the form of manures, for the sole benefit of the growing crop. But probably the chief crime of these unwelcome intruders, from an agricultural standpoint, is their barefaced theft of moisture. Water supply, so essential, not only for the quantity utilized by the plant, but also as the only means of conveying foodstuffs from root extremity to topmost leaf-tip, is greedily absorbed by these insatiable plunderers, and the legitimate claimants have to go on short commons.

If we examine a leaf under the microscope, we shall find, particularly on the underpage in most cases, an almost incredible number of tiny openings called stomata (literally mouths). From these transpiration takes place. Every plant is, in fact, an elaborate, almost automatic, pumping machine. It has been estimated that foliage gives off many hundred times more moisture than an equal area of surface of a liquid. When we remember this, and notice the rapid evaporation of the latter, we shall faintly realize the immense amount of water diffused into the air by the transpiration of plants. Let us also not forget that this moisture liberated from the soil by weeds is at the expense of the present or subsequent crop. What a neglected fallow means we all unfortunately know. The want of cultivation and the presence of weeds are both responsible for heavy losses of soil moisture. The small return weeds make when turned in under the plough cannot compensate, under our somewhat limited rainfall, for the heavy toll they have exacted on the soil's water supply.

If weeds are permitted to come to maturity with the crop, some of the seeds drop, and eventually grow. Others are gathered, and present themselves in the sample of seed harvested to the depreciation of the market value of the grain. If these samples are sown without careful grading, fouling larger areas as well as the original field is the penalty next seed-time. The necessity of using only pure, clean seed, true to name, has been too long overlooked. It is almost criminal, and it is certainly false economy, to use lower-priced seed that may introduce serious pests on our farms.

Some weeds are parasitic. They live on, and at the expense of the host. Every one is, unfortunately, only too familiar with Dodder and its disastrous effects on lucerne. Among our scheduled weeds are two species of Native Mistletoe. These are responsible for serious damage to fine timber trees. Another reason why weeds are so objectionable to the rural producers is from the fact that they encourage other pests. Insects and their eggs, as well as the minute spores of destructive fungi, are harbored by them. The Rutherglen fly or bug finds congenial shelter among sow thistles and other weeds, whence the insects sally forth to the adjacent fruit trees and ruin the crops. The Shepherd's Purse is a favourite host for a rust fungus, destructive to all the cabbage tribe. Appalling losses have been caused by such pests, and much might have been obviated if there were no weeds or accumulations of rubbish to shelter them.

Other weeds are dreaded by the dairy farmer because they communicate an objectionable taint to milk and its products. Charlock, and in fact the whole cabbage family, might be included in the category. Cape-weed is another alleged offender in this respect. The seeds of several of our noxious plants cause immense losses to the important pastoral industry by depreciating the value of the wool, and in some cases actually endangering the sight and even the lives of the sheep.

A few weeds—and their number apparently lessens as our knowledge extends—are poisonous, and cause the death of domestic animals. Of the aggressiveness of these unwelcome plants we have, unfortunately, many examples. Prickly Pear, Stinkwort, Furze, St. John's Wort, Onion Grass, certain thistles, and many other plants soon take complete possession of the land, if not actively and persistently fought. It is always an ominous sign if a new introduction is left severely alone by grazing animals. It is a distinct warning to the grazier to take prompt action to eject the undesirable settler. The Water Hyacinth, with its beautiful flowers, affords a pretty sight. But it is proclaimed a noxious weed, for it takes possession of and actually blocks water-courses, as may be seen in some parts of the Commonwealth. A competent authority emphatically declares that fully one-third increase in the yields of American farms could be secured by preventing the growth of weeds. He further asserts that the extra production, if weeds were eliminated, would represent an amount more than sufficient to pay all taxes. No doubt this applies to other farms as well as American.

To carry plants to new localities, almost everything that moves has been utilized. Weeds have shown their remarkable adaptability by availing themselves of any and every possible means of wide distribution. Birds help to keep weeds in check by devouring seeds. But they also assist in disseminating them. Most will remember Darwin's interesting investigations on the subject. The emu has been credited with having distributed the obnoxious Prickly Pear over wide areas in Queensland. In the Geelong district bulblets of the pernicious South African Wood Sorrel were carried by sparrows. In fact, many plants are scattered in the form of seed by our feathered friends. Mud attached to the feet of aquatic birds has been found to contain seeds of many species of marsh-loving plants. Soil from wheels of drays and waggons, carriages and motors, bicycles and perambulators, on examination, will often reveal seeds. Our agricultural implements transport a considerable share from field to field. Rivers, creeks, and irrigation channels bear seeds along the streams. The sea itself is a well-known agent in the dispersal of seeds, some of them representing weeds. We have

seen seeds borne on racing currents sweeping between reef-engirdled islands in the tropics, where with anchors down and steam up, the boat was ready for any emergency. A mattress washed up from a wreck on King Island brought the King Island Melilot seed ashore. The wind carries myriads, especially such as are provided with wings, or sails, or parachutes. Icarus dropping because he has lost his wings in mid-air is typical of many seeds. Furze and other pod-bearing plants eject their seeds to a considerable distance by a contraction or twisting of the pod. Tumble weeds have no time to lose in their advance to found new colonies. Every animal carries seeds on its coat of fur or wool or hair. We see some attached to the manes and tails of our horses. Even insects such as locusts carry seeds. We ourselves are perhaps the worst offenders, as these hooked and prickly seeds steal a ride attached to our clothing. These are cast off probably in a new locality. Every ship brings stowaway seeds. Every case with straw packing harbors others. Several seaside plants and the King Island Melilot were transmitted across the State in truckloads of seaweed. Every sample of impure seed introduced to a district does incalculable harm. Darwin says Docks were introduced to New Zealand by a rascally seed merchant who sold the seed for that of tobacco. Dodder comes with lucerne and clover seed, and weeds of all descriptions are scattered broadcast with every sample of adulterated or carelessly cleaned seed. The manure collected from town stables, and the contents of rubbish bins where packing is emptied, often introduce previous unknown as well as commoner weeds to the farm. Vigorous weed communities round the manure heap attest this. These are some of the many means by which weeds are spread. But for limitations of time and space, almost innumerable examples could be given.

For the suppression of weeds there is practically only one cure, and that is cultivation. It is noticeable how clean a grain crop is when it follows in the rotation a worked fallow or crops such as roots, sorghum, &c., which are cultivated. Allen says that in parts of China and Holland weeds are almost unknown. This is due to the dense population and the consequent necessity of tilling every available foot of land. "Weeds," says Bailey, "are never serious where lands are well farmed." Certain weeds, too, are vigorous for a time, and then seem to wane. Possibly the land gets sick of the weed as it does with such plants as clover. Some weeds with food reserves in underground stems can only be destroyed by refusing to allow them to form leaves.

Birds devour immense quantities of weed seeds, and so materially arrest their abnormal production. Chemicals are sometimes used, but they are apt to render the land for a time unprofitable, while if poisonous they endanger the lives of stock. A novel method of destroying weeds along railway tracks comes from Illinois, America. A brush heavily charged with electricity is drawn along a few inches from the ground. Every plant touched is killed, and the cost of treatment is said to be insignificant.

It is proposed to enumerate some of the commoner weeds found in this district. Referring to the scientific or botanical name of the plant, it will be noticed there are two, which have sometimes been compared to our own surname and Christian name respectively. The first plant name is that of the *genus*, which includes plants that possess the same constant general characters. The second or specific name records more or less individual or minute characters. Again, allied genera are gathered together into larger groups called natural orders. If we

examine the flowers of sweet-briar, bramble, raspberry, almond, cherry, apple, and pear, we shall find certain striking resemblances. These all belong to the order Rosaceæ. The sweet briar is in the genus *Rosa*, from which the order is named. To distinguish it from others of the same genus, its individual name is *rubiginosa*. This is given from the glandular rusty red hairs of the young leaves. The bramble and raspberry belong to another genus of the Rose family called *Rubus*. The almond, cherry, peach, and plum belong to the genus *Prunus*, and are each distinguished by individual or specific names. These botanical names are not given haphazard. Take *Convolvulus arvensis*. L., the troublesome Bindweed. The generic name refers to the twining habit characteristic of these plants. The specific name records the fact that this particular convolvulus has a liking for arable land. Another common weed here is the red flowering creeping Mallow. This is botanically *Modiola multifida* (Moench). The first name is Latin for the nave of a wheel, and was given because of the arrangement of the fruitlets. The second name refers to the divisions of the leaf. So we see there is almost a history of the plant hidden in its somewhat unattractive name. Sometimes, however, it must be admitted the names are not so descriptive, but are given in honour of the discoverer, or some more or less worthy person. Occasionally the same plant is described by two botanists independently under different names. To prevent confusion, and to indicate clearly the plant meant, it is usual to place the name of the botanist after the name he has bestowed.

The following brief notes are confined to the weeds found in this district. All the "proclaimed" plants are figured either in the thistle pamphlet by the late Baron Von Müeller, or the excellent *Hand-book on Weeds* by Professor Ewart and J. R. Tovey. Both these publications are issued by the Agricultural Department, and contain full descriptions of plants treated. The plants will be dealt with in three lists. The first will include local plants, which are proclaimed for the whole State. The second list deals with the plants found locally that are proclaimed for some portion of the State. The third division will comprise weeds that have not hitherto been deemed sufficiently serious to warrant proclamation. They are, however, more or less widely spread, and in a greater or less degree troublesome. They are enumerated in the alphabetical order of their botanical names, and those that have actually been found on the Experiment Farm are marked with an asterisk. These were a legacy when the mining reserve was taken over. Little by little they are being controlled, for these undesirable aliens crowd out our useful native grasses.

1. LOCAL WEEDS PROCLAIMED FOR THE WHOLE STATE.

**Brassica sinapistrum*. *Boissier*. (*Sinapis arvensis*. L.).—Charlock, Wild Mustard. Order Cruciferæ: Cabbage family. The generic name is from *Bresic*, the Celtic name for cabbage, and the specific name refers to its mustard-poultice properties. Native to Europe, Asia, and Northern Africa. A common, rough annual, usually yellow flowered, and a very troublesome weed of cornfields. Like many of the Cruciferæ, it readily communicates a taint to milk when eaten by dairy cows. As these plants contain oil of mustard, they are inclined to be stomach irritants. The plant leaves a dirty green discoloration on the hand when pulled. The vitality and longevity of the seeds are remarkable. Professor Peter, of Gottingen, says they actually retain their vitality for 40 years if deeply buried. Spraying with

copper or iron solution is said to be efficacious against Charlock when young, without having any deleterious effect on the young growing cereals. Well worked fallows and rotations are the best cure for this and most other weeds.

**Carduus lanceolatus.* Scopoli. Spear Thistle: Black Thistle (N.S.W.) Bull Thistle (America). Order Compositæ: Daisy family. Carduus is the Latin term for thistle employed by Virgil. Some derive the name from Celtic *ard*, a point, from the spiny nature of the plants, which is appropriate, as is also the specific name referring to the spear shaped or armed foliage. Indigenous to Europe, Asia, and North Africa. This is a well-known and widely-spread thistle which grows to a large size. Occasionally it is called the Scotch thistle, but this name belongs to another plant altogether. Cattle and horses eat the large, purple, somewhat egg-shaped flower-heads. The wavy-edged leaves are spiny, and the stems are winged, furrowed, and spiny. This and other thistles should be cut, and not allowed to seed. If cut too late, the seeds ripen on the plants after they are cut. The true heraldic Scotch thistle (*Onopordon acanthium*. L.) was, it is said, adopted on the national coat of arms because a barefooted Dane, in an attempted night surprise on the Scots, trod on this prickly plant, and revealed his presence by his cry of pain.

**Carduus Marianus.* L. The Spotted or Milk Thistle. Order Compositæ: The Daisy family. This is also a native of the same continents as the last. Derives its specific name in honour of the Virgin Mary. It grows to a good size, has large, purple, globular flower-heads, and large glossy leaves veined or splashed with white. Cattle will eat the flower-heads and even the leaves of this plant, which can be siloed.

**Carduus pycnocephalus.* Jacquin. Shore or Slender Thistle. Order Compositæ: The Daisy family. Native to the Mediterranean region. The specific name is in allusion to the crowded flower-heads. Is a rather tall, but less robust plant than the two former, somewhat cottony, stems slightly winged. The flowers are purplish or even pinkish. *C tenuiflorus* (Curtis) is a variety.

**Centaurea calcitrapa.* L. Star Thistle. Cocklebur (N.S.W.). The generic name is from the myth that when Hercules wounded the centaur Chiron, the latter healed his foot with a plant which he named Centaurea. The specific name is from Latin *calx*, heel; *trapa*, snare, and compares the spiny flower-heads of this plant with the old military caltrop thrown before advancing cavalry to injure the horses. This plant is, unfortunately, too well known in this district. It is a dwarf plant, somewhat hairy or woolly, and much branched. It is easily recognised by its "star" of spines on the purple flower-heads. Seeds do not "travel" far. Comes from same continents as last four weeds.

**Centaurea melitensis.* L. Malta Thistle. Cockspur. This is another introduction from Europe, being also native to Asia and North Africa. Its specific name refers to its connexion with Malta. This is a common pest of farm lands and waste places. The plant has a grey, downy or cottony covering, especially when young. The stems are slightly winged, and the flower-heads are yellow.

Centaurea solstitialis. L. St. Barnaby's Thistle. Yellow Cockspur (S. Australia). The specific and popular names were given because in the Northern Hemisphere, where it is indigenous, this thistle blooms about the time of the summer solstice, which is near the date of St. Barnaby's Day. This thistle is closely allied to the Malta thistle, but is more downy, the stems are more winged; there are longer spines on

the flower-heads and longer bristles on the pappus, *i.e.*, hairy tufts on so-called seeds. So far, it is not so common in the immediate district as in the adjoining municipalities.

Conium maculatum. L. Hemlock. Order Umbelliferæ: Carrot and Parsnip family. The generic name is from a Greek word *Konos*, meaning to whirl about, because this plant, if eaten, causes vertigo and death. The specific name means spotted and refers to the stem. The plant is an introduction from Europe and Asia, and is occasionally met with in gardens where it is grown under the name of "Carrot Fern." The only specimens seen in the district were cultivated, but were immediately destroyed when their character was known. This is a tall plant with much divided leaves, spotted stems, and flower-heads in umbels typical of the family. It is quite unrelated to the ferns, but belongs to the carrot family, and is, in fact occasionally called "Wild Parsnip." Its leaves when crushed have an odour resembling that of mice. The plant contains a very dangerous poison.

**Convolvulus arvensis*. L. Bindweed. Order, Convolvulaceæ. Both names are from the Latin. The first from *convolvo*, to entwine, refers to the habit of the plants, and the specific name indicates its partiality for cultivated lands. The Bindweed has a prostrate or twining stem and arrow-shaped leaves. The flowers are attractive, pink or almost white in colour, and scented with a peculiar odour. It comes from Europe, and is one of the questionable characters in an order which has given us graceful garden plants. It twines round other plants to place itself in a better position for light, and so chokes or smothers its benefactor. Where it is prevalent young vines are sometimes injured in this way. Being perennial, it is one of the worst weeds to cope with when allowed to obtain a footing. Every portion of the creeping stem will grow. The seeds are said to be injurious to stock. The plant has spread extensively over the world. It is viewed with dismay by American farmers.

**Cuscuta epithymum*. Murray. Dodder. Order, Convolvulaceæ, Cuscuta is a corruption of the Arab name. All species are scheduled for the whole State. The dodders are introductions from the old world. This one is a leafless plant with tiny flowers in clusters. Its fine yellow stems may be seen entwining such plants as lucerne and others, and adhering by suckers. This is one of the decidedly bad characters in an old and rather aristocratic family. The absence of chlorophyll is conclusive evidence of its dishonest method of obtaining its living. Being parasitic, it plunders, drains, and finally kills its host, hence deserves to be called a plant murderer. The seed is usually introduced with lucerne, clover, &c. It germinates into a thread-like, leafless plant, incapable of deriving its food direct from soil and air. It soon attaches itself to its host, and has no subsequent direct contact with the soil. Many other plants are seized upon as hosts besides those mentioned. From its fine stems it is known in the Channel Islands as Fairies' Hair. In Cape Colony spraying with ½ lb. arsenite of soda to 5 gallons of water is credited by the *Agricultural Journal* with destroying this pest in one proper application without injury to the lucerne host. Equally effective is said to be a spray of 1 lb. of sulphate of iron to 8 gallons of water.

Datura Stramonium. L. Thorn Apple. Order, Solanaceæ: The Potato and Tomato family. The generic name is from the Hindoo *dhatura*, which is said to be a corruption of *tatorea*, its Arab name.

The specific name is claimed to be from the Greek name of the mad-apple. Originally a native of the East Indies, the seeds of this plant were disseminated over Europe by Gypsies. It is now found in all temperate climates. The leaves are roughly triangular in shape with toothed margins. The flowers—once called devil's trumpets—are large, trumpet-shaped, usually white with yellowish points. The egg-shaped seed vessels are covered with prickles. Like many others in the family the plant is strongly narcotic and decidedly poisonous. It is included in the British Pharmacopæia. The leaves when smoked are a remedy for asthma. Not widely spread here, and practically confined to the east of the town. The order gets its name from the soothing or narcotic properties of so many of the included plants.

**Echium violaceum*. L. Paterson's Curse. Blue Weed and Salvation Jane in South Australia. Order, Boraginaceæ; Borage or Heliotrope family. The generic name is from the Greek *echis*, snake, either from the fancied resemblance of the seeds to a snake's head, or perhaps from its once reputed curative properties in snake bite. The specific name refers to the violet or purple coloured flowers. This is an introduction from South Europe, and owes its popular Victorian name to the individual credited with its introduction. This is an erect, branched, hairy plant with pretty purple flowers. When very young it is eaten by both sheep and cattle. Is spreading rapidly in parts of the district, and is plentiful about Gooramadda. Bees are said to be fond of the flowers. *Echium candicans*. L., a garden plant, is called "Bee Flower."

**Hypericum perforatum*. L. St. John's Wort. Order, Hypericaceæ. The generic name was given by Dioscorides, and is said to be derived from the Greek *hypo*, under or among, and *ereike*, heath, from its habitat. Others derive it from *eikon*, image, from a fancied figure in flower; while yet others consider it is from a Greek word meaning to protect, from its supposed influence over evil spirits. The second name refers to the perforated appearance of the leaves owing to dots. A native of the three older continents. This plant was introduced into Victoria for its reputed value in domestic medicine. It is a garden escape from Bright, whence it has spread with disastrous results, as it is difficult to eradicate. The yellow flowered clusters are pretty. The plant propagates by runners, underground stems and seeds, and is already a very serious matter in certain parts. Probably no plant enjoys a greater celebrity in flower-lore, and extraordinary properties have been ascribed to it.

**Inula graveolens*. Desfontaines. Stinkwort. Order, Compositæ: Daisy and Sunflower family. The origin of the generic name is unknown—thought to be a corruption of Helenium. The specific name is appropriate, as it means strong smelling. This is another native of the Mediterranean region. It is quite sticky and hairy, and has a characteristic odour when bruised. Like most of the Compositæ, its numerous downy seeds are scattered far and wide by the wind. Sheep eat it in its young stage if obliged, and the South Australians find one of the best methods to suppress it is to crowd on the sheep while the plants are young. In the adjacent State referred to, it has been known for over half a century, and is a most noxious weed. Years ago it was proposed to extract the oil to treat timber against insect attacks. The first plant noticed by the writer in this locality was near Howlong in 1899.

**Kentrophyllum lanatum.* De Candolle. Saffron Thistle; Woolly Star Thistle in South Australia. *Kentron*, a goad or spur; *phyllon*, leaf, Greek, from the spiny foliage. The specific name refers to the woolly covering of plant. This yellow flowered thistle is the most widely spread of any proclaimed weed in this district. It is a tall annual, and woolly. The streaked stem is often much branched. It is called the Saffron Thistle, from its original inclusion in the same genus as the spurious saffron plant.

Loranthus pendulus and L. *celastroides.* Sieber. Mistletoe. Loranthus is derived from the Greek *loron*, thong, and *anthos*, flower, from the shape and substance. These are hardly agricultural, as they are parasitic on native and other trees. Owing to the damage done to timber trees, they are proclaimed for the whole State.

Lycium horridum. Thunberg. African Box Thorn. Order, Solanaceæ: Potato and Tomato family. Lycium is the name of a place in Asia Minor where first species were originally found. The specific name refers to the horrid prickles. An introduction from South Africa. Forms an impenetrable hedge, but requires constant attention to keep it in bounds. Being a gross feeder it robs the soil of food and moisture for some distance. Affords a perfect harbor for sparrows and other feathered pilferers. Readily spreads, and has, like several other hedge plants, been proclaimed for the whole State.

**Opuntia monocantha.* Haworth. Prickly Pear. Order, Cactaceæ. The generic name is from Opus, a Greek town, where earliest described species was found. The derivation does not now apply to the species placed in this genus, as all are American. The specific name, too, is somewhat of a misnomer, as it means single spine. Cactus was the name given by Theophrastus to some prickly plant. So far this plant is only met with in gardens and rockeries in this district. When once it is established, it is difficult to eradicate it, as almost every fragment will grow. Is a national menace in Queensland's tropical climate. The proposal to utilize the plant extensively as fodder is impracticable, as its food value is insignificant. This is a leafless plant, the flattened branches performing the functions of leaves. The fruits are edible and palatable to any one brave enough to risk the tiny prickles with which they are amply provided.

**Raphanus raphanistrum.* L. Wild Radish: Jointed or White Charlock. Order, Cruciferæ: The Cabbage family. The generic name is the Greek term for the radish, from *ra*, readily, quickly, and *phaino*, to appear, because the seeds germinate so quickly. This is a troublesome weed. The flowers are white with coloured veins, or straw coloured, but frequently a deeper yellow. The plant is somewhat hairy, with coarsely toothed lyrate leaves. It is not so prevalent as Charlock, from which it may be distinguished by the jointed pods

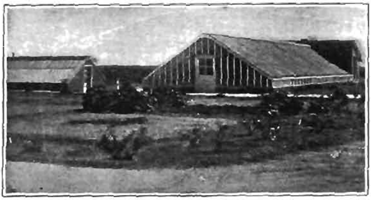
**Romulea cruciata.* Ker-Gawl. Onion Grass. Order, Irideæ: The Iris family. Named after Romulus, the mythical founder of Rome. The specific name means cross shaped, and refers to the appearance of a transverse section of a leaf. This is an introduction from South Africa. A few years ago it was difficult to get a specimen in this district; now its pretty pink flowers are common along many of the roads in spring. The bulbs, or more strictly speaking the corms, contain reserves of food which enable the plant to develop leaves comparatively early in the season. The popular name is from a fancied resemblance to the onion.

Rosa rubiginosa. L. Sweet Briar. Order, Rosaceæ: The Rose family. The generic name is Latin for the rose, and the specific name means rusty, from the colour of the glands or young leaves. A well-known hedge plant, spreading by suckers as well as seeds, which are carried by birds. May become a troublesome pest as in other parts. The perfume from the plant is very pleasant, especially after rain.

Rubus fruticosus. L. Bramble. Blackberry. Order, Rosaceæ: The Rose family. *Rubus* is the Latin name for the bramble, perhaps from *ruber*, red, the earliest known species having red fruit. The specific name means shrubby. There are only two or three places in the district where this plant has been seen by the writer. It formed, in each case, part of an old hedge now burnt off. In some of our southern forests it is a terrible pest. The fruits are palatable, and make excellent preserves.

**Xanthium spinosum.* L. Bathurst Burr. Burweed (N.S.W.). Order, Compositæ: Daisy, Thistle, and Sunflower family. The generic name is derived from the Greek *xanthos*, yellow, for plants of this genus yielded a yellow hair-dye for the ancients. The second name refers to the spiny nature of this species. Native of the Mediterranean region, also claimed as indigenous to South America. Introduced into Australia about half a century ago, the seeds being concealed in the hair of manes, tails, or fetlocks of some imported ponies. Bathurst Burr is a robust, branched, spiny annual, leaves dark green above and white below. The burrs are provided with hooked prickles by which they become readily attached to animals or clothing, and so "steal a ride." This is a very troublesome weed.

(*To be continued.*)



THE VALUE OF EXPERIMENT AND RESEARCH IN AGRICULTURE.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Department of Agriculture, Victoria.

Agriculture is an art, based on science, and capable of great development and expansion as the scientific principles on which it is based become more and more completely understood.

The primary object of the scientific investigator of agricultural problems is to discover the principles or laws underlying agricultural phenomena in order to explain and also to anticipate farm practice.

The investigator may proceed in the elucidation of these problems either by observation or by experiment. The use of definitely planned, carefully conducted experiments is the most satisfactory method of arriving at these principles, because the conditions under which the phenomena are observed are more or less under human control.

Agricultural experiments may be roughly divided into two classes:—(*a*) Practical experiments, which aim at ascertaining the most prolific crops to grow, and how to secure the greatest monetary return from a given crop. Such practical information is obtained by carrying out cultural and tillage tests, manurial, variety, and rotation experiments, and must obviously be of value mainly in the locality wherein the experiments were conducted. (*b*) Scientific experiments, designed to acquire information regarding the soil, the plant, and the animal, which can be applied universally.

The agricultural practice of any country must remain more or less empiricial unless firmly buttressed by the results of long-continued, systematic experimental work. This is the reason why every progressive agricultural country has established experimental stations for the prosecution of agricultural research. The most famous experimental station is that at Rothamsted, where field experiments have been carried out without interruption for over 70 years. The great object of these experiments, which have profoundly influenced agricultural science and practice throughout the world, is to arrive at principles of universal application, leaving the farmer to apply these principles to his local conditions. The importance and necessity for experimental and research work in assisting agricultural practice is indicated by the fact that in Germany there are over 70 fully equipped Agricultural Research Stations, and 62 similar institutions supported by the Federal and State Governments in the United States.

The history of agricultural science during the last century bristles with achievements destined to profoundly influence agricultural practice.

It is interesting to note that superphosphate, which during the last decade has done so much to improve our wheat harvests, and, without which wheat culture on our older lands would, indeed, be precarious, was first manufactured and applied under field conditions at the Rothamsted Experimental Station by Lawes in 1840, who took advantage of Liebig's discovery that the insoluble phosphate in bones could be made available for plants by treatment with sulphuric acid. In

1887, Hellriegel and Wilfarth, after much painstaking research, first demonstrated to the world that leguminous plants were able to obtain their nitrogen—the most valuable and expensive of all plant foods—from the inexhaustible stores of that substance in the atmosphere, through the action of bacteria which lived symbiotically on their roots.

All other plants must secure their nitrogen from the soil and absorb it in the form of nitrates. Winogradsky showed that these nitrates were formed from the organic matter of the soil in three stages as a result of the activity of three distinct classes of bacteria, and formulated the soil conditions necessary for their maximum activity. Subsequent research has demonstrated that organisms exist in the soil (*Azotobacter*), which can actually live on decaying organic matter, and fix free nitrogen from the atmosphere, independently of any leguminous crops, and that these organisms have been found in every latitude, from the wind-swept summits of the Pyrenees to the sandy dunes which skirt our coasts. No longer is the soil regarded as mere mass of pulverized rock, but as a living laboratory swarming with countless millions of microscopic bacteria, some of which work in the farmer's interest, others to his detriment, and which class shall ultimately prevail depends on the farmer himself and the physical condition in which he keeps his soil. Modern biological research demonstrated that the fertility and productive capacity of any soil is largely dependent on the nature and activity of the bacteria inhabiting that soil. No less interesting are the many contributions of the chemist to agriculture.

The patent taken out in 1879 for the removal of phosphorus from certain iron ores by means of lime in the Bessemer "Converter" effected a twofold purpose. It enabled iron ores rich in phosphorus to be used profitably as a source of steel, and gave the agricultural world a continuous and ever-increasing supply of citrate soluble phosphate in the form of basic slag, or Thomas' Phosphate.

The simple, yet none the less effective, method of testing the amount of butter fat in milk and cream by means of the Babcock Tester has enabled the commercial value of these articles to be quickly and accurately determined, and is invaluable alike to the factory manager, the dairyman, and the live-stock breeder.

In 1898, Sir William Crookes, in his presidential address at Bristol to the British Association for the Advancement of Science, predicted an approaching nitrogen famine owing to the rapid diminution in the visible supplies of nitrate of soda in Chili and Peru. In 1913, however, the inexhaustible reserves of nitrogen in the atmosphere are being enticed into combination with lime and other substances by the electrical energy generated from the waterfalls of the Norwegian Fiords, and the products—nitrolime and nitrate of lime—are being used by the Victorian farmer to stimulate his hay and root crops.

The pathologist and entomologist have also rendered signal service. The life history of most fungoid and insect pests have been worked out in detail, and their weaknesses detected.

The majority of these pests are now so subject to the farmer's control and cure as to occasion little more than passing thought.

Among many instances might be mentioned Smut and Bunt in wheat, Aphis and Scale in fruit, Phylloxera in vines. That much still required to be done is obvious when we consider the ravages of Bitter Pit in apples, Rust in wheat, and Irish Blight in potatoes.

The most fascinating and potentially valuable contributions to agriculture have been made by the plant breeder, and it would appear that, when the vacant spaces of the globe are all inhabited, the limits to crop production will be governed only by the limit set to the plant breeder's work.

Twenty years of systematic research by that patient and retiring genius—the late William Farrer, of New South Wales—culminated in the production of Federation wheat a variety which has added millions sterling to the pockets of the Australian wheat-growers. The colour of the Australian harvest field—formerly a bright golden—has been changed gradually to a dull bronze through the widespread popularity of Farrer's prolific and ubiquitous wheat.

Bobs and Comeback, two of the best milling wheats in the world; Firbank, a remarkable hay wheat; Florence and Genoa, Smut-proof varieties; Jonathan, Bayah, Cleveland, Rymer, Genoa, and Cedar, and a host of other widely-grown varieties, are monuments to his industry and painstaking toil.

In England, Biffen has succeeded in producing the apparently impossible combination of high yield, high strength, and gluten content, and rust-resistance in the one variety of wheat.

By the development of early maturing varieties, the wheat belt of Canada has been pushed northward several hundred miles.

South Africa now claims to have grown a rainless wheat. By systematic breeding the starch content of potatoes, the oil content of maize, the percentage of gluten in wheat, and the sugar content of beets has been greatly increased.

New creations have been produced by the plant-breeder, for which names had to be invented, *e.g.*, tangelo, pomato, and citranage; whilst white blackberries, seedless apples, pitless plums are now accomplished facts.

To turn now to the field experiment. It may be said that these are of incalculable value to an agricultural State, and of great educational value to the farming community, provided that these experiments are systematically conducted and permanent in character. The most material problem ahead of this Commonwealth is to develop permanent systems of agriculture in each province which will enable maximum crops to be annually obtained without impairment of the soil's resources. It is a matter of common observation that virgin land is far more productive than land in the same locality which has been under cultivation for any length of time. We are constantly hearing of "worn-out" wheat lands, and this is a comparatively young agricultural country. This diminution of soil fertility is by no means confined to the wheat areas, but is observable in lands of high capacity in the well-watered districts of the State.

It is a fact that there are systems of farming in practice which have already depleted many soils of their abounding virgin richness, and which threaten to further deplete them below the limits of profitable production. It must be obvious that with constantly increasing

population, and diminishing productive power of the soil, the time must soon come when our national welfare will be threatened unless provident methods of cultivation are followed. The conduct of systematic, rationally-conceived, permanent experimental plots will be a most invaluable medium in unfolding those systems of farming which will provide not only for maximum crops, but also for the maintenance and increase of soil fertility, and the longer such cultural, tillage, manurial, and rotation experiments are conducted the more and more valuable will the results be, not only for the individual farmer, but also for the State.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART XIV.—CO-OPERATION IN THE DISTRIBUTION AND MARKETING OF FRUITS.

(Continued from page 250.)

By E. Meeking, Senior Fruit Inspector.

Of all the methods of combination mentioned in the foregoing chapters, the true co-operative form is that which most recommends itself as the one which gives to its individual members enhanced benefits without a corresponding interference with public interests. In fact, so far as the producer is concerned the experience in other countries shows that, whilst co-operation properly applied has benefited the producer by giving him increased profits, it has at the same time given the consumer a better and cheaper article.

The unique position of the producer moreover prevents him from combining on the same lines as can be successfully undertaken by those interested in the handling and marketing of his products.

A body of farmers attempting to form a trust or combine on the lines of, say, a steel combine, or a shipping combine, would fail, firstly, b reason of the unavoidably large number of members; secondly, because of the comparative isolation of the members one from another; thirdly, on account of the producer being as before stated, both an employer of labour and a labourer; and, fourthly, want of business training.

DEPENDENCE OF THE FARMER UPON OUTSIDERS IN HANDLING AND MARKETING OF HIS FRUIT.

The operations of an individual farmer are by force of circumstances mostly confined to his farm. His prime object is to produce, and, whether he likes it or not, he must leave other operations connected with his livelihood (handling, marketing, and distributing) in the hands of others. It is in connexion with these operations that many of the objectionable features of the non-cooperative system become apparent.

Those who handle, market, and distribute the producer's goods may be willing within limits to give the producer fair treatment, but no individual or body of individuals is entirely responsible for the proper

carrying out of all these operations. The interests of those concerned are, moreover, widely separated in many directions one from each other.

In consequence, when unsatisfactory results occur, each party is prone to charge some one else with the blame.

This will be more clearly understood if we follow in imagination the vicissitudes from orchard to consumer of a case of apples grown in this State for export to the United Kingdom or Europe.

Multiplicity of Individuals Concerned in Handling, Transport, and Marketing.

The growth and care of the fruit and its picking, packing, and delivery to the local railway station are attended to by the orchardist.

Its transport to the seaboard is undertaken by the Railways Department. The agents' handling committee carry out any further handling and adjustment which may be necessary. The officers of the Department of Agriculture inspect the fruit to see that its condition and the trade description on the case are in compliance with the commerce regulations. The stevedoring company then load and stow the fruit into the ship. The agent for the grower attends to payment of freight, insurance, and the filling in of necessary documents, such as bills of lading, insurance policy, and advice note. The fruit is then exclusively under the care of the shipping company during the voyage.

On arrival at its destination it is unloaded from the vessel by another stevedoring company, and if intended for the London market, it is conveyed by rail or lighter to the city, where it is again unloaded on to vans or lorries, conveyed to the auction room or market, to be once more unloaded and given over to the agent or auctioneer for sale. The auctioneer then sells it to the wholesale dealer, who in turn conveys it to his place of business, where it is disposed of to the retail seller, from whom it finally reaches the consumer.

Combined Effort Necessary to Protect the Outside Interests of the Producer.

The above will give some impression of the number of individuals or bodies of individuals concerned in the handling and transport of a case of fruit from the orchard to the consumer when shipped to the oversea markets. The same condition of affairs obtains with respect to fruit consigned to Inter-State markets, and in lesser degree to fruit forwarded for local sale. It should convey to the mind of the grower the impotence of individual effort on his part to provide against indifferent or unfair treatment which his fruit may receive during transit and sale. It must be clearly understood that none of the parties are concerned to the same extent as the grower, in seeing that the fruit should realize the best price possible.

Freights, commissions, and other charges, are usually collected regardless of the condition of the fruit at the time of its sale, and irrespective of the prices which it may realize.

It may be contended that the salesman who disposes of produce on a commission basis is, at any rate, interested in obtaining the highest price possible.

This is true, but only to a limited extent. Even if prices are low the salesman is enabled to charge something in the way of commission. Low prices do not mean to him loss to such an extent as they mean to the producer.

SUPERVISION OF TRANSPORT AND SALE NEEDED.

The system, moreover, which permits the sale of produce without supervision or check in some form, to directly safeguard the interests of the producer, is, to say the least, most unbusinesslike. The producer, obviously, needs something which will enable him to exercise some control in the matters of transport, distribution, and sale of his produce. Such control cannot be obtained by individual effort, which at best is only spasmodic and disconnected, and therefore cannot produce definite results nor lasting benefits.

Supervision should be continuous, systematic, and careful if correct conclusions are to be arrived at. These remarks apply with particular force to fruit which, without the application of proper treatment during the time it is passing from the orchard to the consumer, is more perishable than any other class of produce.

DEPENDENCE OF THE FRUIT-GROWER FOR SUPPLIES OF ACCESSORIES.

In addition to his dependence upon others for the transport, distribution, and sale of his produce, the fruit-grower is also dependent upon outsiders for the supply of orchard materials.

Spraying materials and machines, implements for cultivation, pruning, and irrigation; and cases, wrapping-paper, nails, and other accessories in connexion with the packing of his fruit are all obtained from different outside sources. Many of the articles mentioned are manufactured by concerns organized to conserve their own interests.

Under present conditions the grower has no assurance that these accessories are supplied to him at the lowest possible cost, as the supplier is under no compulsion beyond ordinary trade competition with other suppliers to enforce him to sell the goods to the producer at low cost. In fact, he has every inducement to charge as much as possible, so that his own profits may be enhanced. In all his transactions, therefore, both on the buying and on the selling side, the producer clearly is an unorganized unit, without special business training, dealing with a number of individuals, each specialists in his particular line of business. He cannot, as has been shown, combine with his fellows on the same lines as can those who are engaged in the handling, transport, and sale of his produce, yet if he is not combined in some way he cannot hope to conserve his interests. Co-operation carried out under proper methods provides the only means whereunder the fruit-grower may meet on equal terms those engaged in business transactions which are closely associated with his livelihood.

(To be continued.)

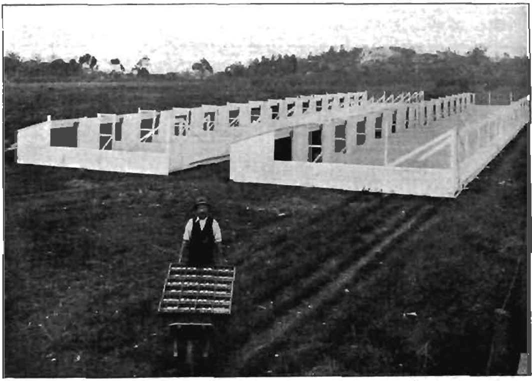
I DO not entertain for a second the thought that we have approximated the limit of our output from the soil. As a matter of fact, we have just begun to attack the problem. We have not even reached the end of the pioneering stage, and have only in a very few localities developed conditions where maximum returns may be secured. But we have unmistakably reached the period where we must think, and plan, and work. We can no longer rely on the bounty of nature.—*D. F. Houston, Secretary of Agriculture, United States of America.*

REPORT ON THIRD EGG-LAYING COMPETITION AT BURNLEY, 1913-1914.

By A. Hart, Chief Poultry Expert.

In submitting my report of the recent Egg-laying Competition at Burnley there are many interesting, and also instructive, features in connexion with the tests which have from year to year been conducted.

By a comparison of the results in the various competitions in the Commonwealth and New Zealand, much information may be derived. These tests were first instituted in New South Wales in 1902, and in Victoria in 1904. They were, however, conducted in America as far back as 1897, when 224 pens of eight birds each were entered for a laying competition, conducted by an American journal entitled the *National Stockman and Farmer*. The results were very satisfactory in the way



Egg-laying Competition, Burnley. Section of Pens erected for the Heavy Breeds.

of egg production; but, as the birds were all kept and fed by their respective owners, the value of the test, as far as an official record was concerned, was considerably discounted.

The first yearly test conducted in our State was at Dookie College in 1904-5, under the supervision of the Principal (Mr. H. Pye). This test was won by six white leghorns owned by Mr. G. Levens, the six birds producing 1,313 eggs during the twelve months. These tests were continued at Dookie for three years, Mr. H. Bunneman winning the last two. In 1905 his six silver wyandottes produced 1,296 eggs in the year, and in 1906 the same owner's six white leghorns won with 1,314 eggs for the twelve months. These figures were thought to be really good at that time, and the Principal of Dookie was very well satisfied with the results

of the tests; but if the above figures are compared with those put up by the winning birds at the recent test at Burnley, the comparison must produce indisputable evidence of the wonderful improvement which has been effected in the egg-producing qualities of white leghorns during the past seven years. The six birds in the Dookie test averaged 219 eggs each, and the same number of birds in the Burnley test put up an average of over 277 eggs each, this being an increase of over 58 eggs from each bird. Such a substantial increase from a single pen is very creditable, and the result from the whole of the competing birds is also satisfactory. The total number of eggs produced from the 378 birds competing at Burnley was 80,429.

The laying competitions must, to a very large extent, be given the credit of effecting this increased egg production. The benefits of the increase is, however, not confined to the competing birds. By a distribution of stock from birds possessing these valuable egg-producing capabilities the laying qualities of the general flocks have been improved to

First Prize Pen White Leghorns, owned by J. H. Gill, 1,667 eggs for twelve months' test. Constituting Official World's Record.

a large extent. It is in this point that the greatest importance is attached to the results of the tests. The high average egg production of 300 or 400 birds in a laying competition does not increase the general egg production to any great extent, but when the increase is introduced into the 4,000,000 of laying fowls in our State, its importance can be easily understood. If only an average increase of one dozen eggs from each hen could be effected this would increase Victoria's egg production by about 4,000,000 dozen per year, which, at 1s. a dozen, would mean £200,000. This increase should be easily effected, and, in my opinion, a greater improvement could be made. When figures of this kind are taken into consideration the importance of the egg-producing industry cannot be easily over-estimated. The fact also remains that there is still plenty of scope for improvement in this direction. The present high ruling prices of eggs are certain evidence that the supply as yet does not equal the demand. With the excellent and reliable methods now

practised of keeping eggs by cold storage or preservatives, they may be kept for almost any length of time in good condition, and placed on the market when the new-laid product is both scarce and dear. It speaks well for the extent of the demand at present when, even with the supply of cold storage and preserved eggs, which are now being placed on the market, that such high figures are ruling. The Victorian public now consume a much greater quantity of eggs than in former years. This has, to a great extent, been brought about through eggs being now much more reliable for table purposes than formerly. An improved system of gathering, keeping, packing, and regular marketing of fresh eggs has been the means of effecting the increased consumption, and the reliable methods of cold storage and preserving has also had a marked influence on eggs of what might be termed a second grade. Taking the whole of the branches of the poultry industry into consideration, the prospects must be described as particularly encouraging. There has, however, been a far greater improvement made in egg production than what

Second Prize Pen White Leghorns, owned by W. G. Swift. 1,547 eggs for twelve months' test.

has taken place in breeding birds for table purposes, and the latter branch might with advantage receive more attention than what it does at present.

There is also another point to which I would direct attention, and *that is the improvement of the egg-producing qualities of other breeds* besides white leghorns. I am quite prepared to grant that the white leghorn is now undoubtedly the best egg producer, and every credit is due to those breeders who have devoted both time and money in placing this variety at the top of the tree, but when we estimate the value of the wyandottes, black orpington, and other heavy breeds for table and general purposes, the inducement for breeders to try and improve the egg production in these varieties is certainly very encouraging. The old adage that "it is not wise to place all the eggs in one basket" might easily be applied in this case. In my opinion, there is a very promising opening for breeders to take on the improvement of the egg-producing

qualities of either wyandottes, orpingtons, plymouth rocks, Rhode Island reds, and Sussex fowls. It only requires careful mating, breeding, and selection of the stock to insure success, and the return would, I am quite certain, justify the outlay. Already a start has been made in this direction, and it only requires following up on correct lines to bring the birds up to the high-grade egg producers, as well as being first-class table birds. They may not ever reach the 280-egg bird per year as the white leghorns have done, but the extra egg production which should be received from wyandottes and black orpingtons during the winter months, combined with their table qualities, must be taken into consideration, and, in my opinion, they should, when the egg production is improved, return in the end just as payable results as white leghorns.

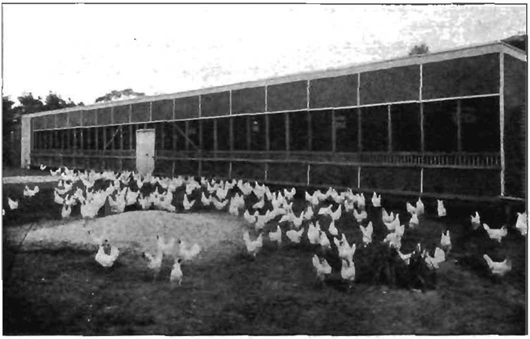
The laying competitions held at Burnley have all been under Government supervision, and it is pleasing to note that the official figures are recognised by all poultry-keepers as the most reliable and authentic

Third Prize Pen White Leghorns, owned by E. H. Bridge. 1,539 eggs for twelve months' test.

records. South Australian tests have also always been conducted under Government supervision. New South Wales tests were first instituted by the *Daily Telegraph*, at Hawkesbury College, and were under the supervision of a committee of poultry breeders. They are now, however, held together under Government supervision. As the three States above mentioned, and also Queensland, have all adopted the Government supervision, it goes to prove that the departmental management of these tests have been the most satisfactory in every way.

The tests just concluded at Burnley have given excellent results, both individually and collectively, and, as it was the first test in which I held the position of supervisor, I am highly pleased to be able to report such good all-round results. Sixty-three pens, containing six birds each, competed in the test. Of these, fifty-four pens contained white leghorns, five black orpingtons, two black spanish, and one each golden wyandottes and rose-combed brown leghorns. The winning pen was Mr. J. H. Gill's six white leghorns. The six birds produced 1,667 eggs

during the twelve months, being an average of over 277 eggs from each bird. This constitutes a record from any six birds in the world, under Government supervision. As there were no replacements in this pen during the test, additional credit must be given to the winners. This pen also produced the greatest number of eggs during the winter months, having 533 to its credit in the four months. As an instance of the value of the laying competitions to poultry breeders, I might state that Mr. J. H. Gill, the owner of the winning pen of white leghorns in this test, has refused a *bonâ fide* offer of 70 guineas for the six birds. Under conditions outside of the test these birds would not be worth more than one guinea each, so the increase in value can be easily calculated. This is only one instance, and many others might be quoted to bear out my opinion of the increasing value which results from the tests which are under Government supervision. Another point in which this test exceeds any former competition is the excellent average from the twelve



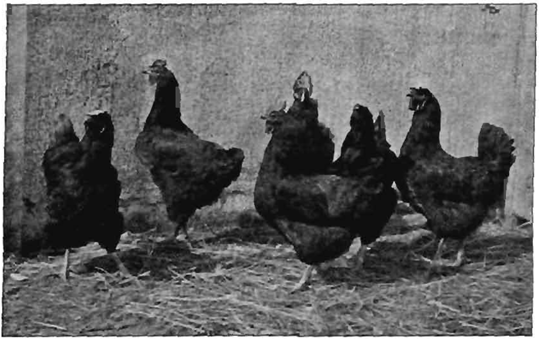
Successful egg-production in large flocks. Size of shed, 100 feet by 20 feet, to house 500 birds.

leading pens. The seventy-two birds in these pens produced an average of 251 eggs each for the year, this being far ahead of any previous figures. The value of the 139 dozen eggs produced by the winning pen, at 1s. 2d. per dozen, was £8 2s. 2d. As the cost of the food for the twelve months was only 5s. 8d. per bird this leaves a profit of £1 1s. 4d. from each bird over the cost of food. The whole of the 378 birds competing in the test averaged over 212 eggs each for the year, this being a record return from that number of birds in any previous test. A profit of 15s. per bird, from 378, was shown for twelve months over the cost of the food. In the heavy breeds, Mr. J. Dallimore's six black orpingtons held pride of place with 1,216 eggs for the year, this being over six dozen behind each bird in the winning pen.

Taking the average egg production of the different breeds, the white leghorns are easily first. The fifty-four pens of six birds each produced

a total of 71,620 eggs for the year, this being an average of over 1,326 eggs from each pen and 216 from each bird. The black orpingtons are second on the list, the five pens averaging 1,144 eggs each, and over 190 from each bird. The two pens of black spanish averaged 1,138 eggs each, the golden wyandottes pen had 1,033 eggs to its credit, and the rose-combed brown leghorn pen 1,016.

The feeding in connexion with the test was very carefully adjusted. Foods containing a good proportion of protein were favoured, and the results speak well for the manner in which the fowls were fed. The morning mash was fed to the birds at 7 a.m. In the cold weather it was given warm, and in the warm weather it was fed cold. The mash was composed of one part wheat pollard, one part oat pollard, one part bran, one part pea meal, and one part lucerne meal. This was moistened with liver soup, and the liver was also minced and added. This mash was fed so that it would crumble easily, and about 2½ ounces



First Prize Pen Black Orpingtons, owned by T. S. Dallimore. 1,216 eggs for twelve months' test.

were allowed for each bird. Green food, in the shape of chaffed green lucerne, silver beet, thousand-headed kale, or milk thistles were given during the forenoon. At noon about an ounce of mash was given to each bird. The evening meal consisted of grain, wheat, heavy Algerian tail oats, maize cracked fine, and occasionally rye was used, the two former giving the best results. About 1¾ ounces was allowed to each bird. A regular supply of charcoal and shell grit was always in the pens. The dust bath consisted of sifted wood ashes, sand, and sulphur, which was slightly moistened during the warm weather. Fresh water was supplied daily, and shade was provided to keep it cool. A little Epsom salts was placed in the mash occasionally, about a packet being given to twenty birds. Nest boxes were provided, and the eggs were carefully collected twice a day. They were put into specially constructed trays, each tray bearing the corresponding number of the pen, thus preventing

any possibility of mistakes. Books were kept, and every day egg production from each pen was entered up separately. The eggs were weighed and the weight entered up. A diary was carefuly written up every night, and was very useful for reference. Broodiness was not nearly so noticeable among the leghorns as in former tests. All birds showing a tendency to brood were carefully marked with a ring, so that the owners could avoid breeding from them in the future. The number of deaths during the year was very small—only two deaths occurred among the 378 birds. There were only seven replacements in the sixty-three pens during the twelve months. Egg-duct and ovary troubles were the cause of the deaths and replacements.

The weather conditions during the winter months were somewhat mild and dry. The temperature was variable, and was as low as 30 deg., freezing the water in the taps several times in June and July. In the

Second Prize Pen Black Orpingtons, owned by Jas. Ogden. 1,208 eggs for twelve months' test.

spring strong winds prevailed, and during the summer the temperature was on several occasions as high as 107 deg. in the fowl-houses.

A word of praise is due to Mr. W. Johnston, his capable management and thorough system of caring for the birds during the whole of the test being responsible for the good results obtained.

The present test, which started on the 15th April, has been increased to 100 pens, and the popularity of the Burnley competition was evinced by the large number of applicants for pens above the required number. This test should be much more instructive than the previous one, as four sections are provided; one is for light breeds, fed on wet mash, and another is for light breeds fed on dry mash alone. Two similar classes

(Continued on page 362.)

Owner.		April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	Total.
J. H. Gill	White Leghorns ..	30	145	141	148	153	148	158	152	137	145	116	134	60	1,667
W. G. Swift	.. .. ..	53	103	100	120	134	141	148	140	143	141	131	139	54	1,547
E. H. Bridge ..	.. .. ..	43	122	112	125	129	144	151	146	137	138	121	122	49	1,539
Moritz Bros.	.. .. ..	15	113	112	119	126	143	164	154	153	152	127	122	22	1,522
Thirkell and Smith ..	.. .. ..	20	120	134	133	134	142	146	137	134	135	108	113	33	1,498
C. J. Beatty	.. .. ..	28	120	126	130	138	150	156	147	126	135	115	95	29	1,495
J. S. Spotswood ..	.. .. ..	64	136	116	95	133	141	157	149	137	125	96	106	35	1,490
G. W. Robbins ..	.. .. ..	12	54	88	130	142	147	155	154	158	146	130	121	40	1,477
A. H. Mould ..	.. .. ..	54	102	100	106	126	140	148	135	133	137	120	128	44	1,473
J. E. Bradley ..	.. .. ..	38	100	104	120	123	134	152	134	134	139	107	138	47	1,470
C. B. Bertlesmeier ..	.. .. ..	8	79	116	112	122	145	156	156	151	146	128	119	24	1,462
T. A. Pettigrove ..	.. .. ..	29	92	121	128	142	145	157	141	130	121	116	99	37	1,458
H. McKenzie ..	.. .. ..	29	77	114	112	131	152	165	142	149	147	121	107	9	1,455
Geo. Edwards ..	.. .. ..	33	98	100	90	121	139	156	143	146	143	124	106	38	1,437
Redfern Poultry Farm .	.. .. ..	17	65	102	105	116	140	153	148	146	141	124	121	24	1,402
A. Ross .. .	.. .. ..	58	108	104	100	121	131	145	140	136	128	94	98	29	1,392
C. Hepburn .. .	.. .. ..	36	56	86	125	98	133	153	148	152	150	112	111	20	1,389
M. H. Noye .. .	.. .. ..	52	80	93	115	133	141	145	136	114	137	100	111	31	1,388
W. Featherstone .	.. .. ..	39	113	86	102	119	136	150	130	143	134	119	100	5	1,376
Jno. Campbell ..	.. .. .	52	121	120	126	136	134	133	97	112	104	101	97	23	1,356
South Yan Yean Poultry Farm	.. . .	2	25	77	112	131	144	161	150	147	142	122	115	22	1,350
R. W. Pope	.. .. ..	51	107	64	89	109	142	150	147	154	147	94	80	15	1,349
H. Hanbury	.. .. ..	33	91	90	101	127	143	153	129	135	126	97	81	33	1,339
E. A. Lawson ..	.. .. .	45	132	124	129	122	135	154	119	115	108	83	61	7	1,334
F. Hannaford ..	.. .. ..	43	90	82	82	101	120	145	142	140	130	121	93	28	1,317
B. Rolls .. .	.. .. ..	20	72	107	116	122	134	144	131	136	136	93	99	4	1,314
C. H. Busst	.. .. .	45	91	90	110	133	134	134	115	113	113	90	92	32	1,292
W. G. Osborne ..	.. .. ..	28	42	64	114	121	130	145	135	143	131	117	97	24	1,291
Percy Walker ..	.. .. .	36	80	87	97	125	133	144	145	132	131	96	71	11	1,288
A. H. Padman ..	.. .. .	25	31	67	79	124	148	154	137	144	143	116	103	11	1,282
Stranks Bros... ..	.. .. ..	25	68	98	104	123	133	152	139	134	122	91	68	20	1,277
W. McLister	.. .. ..	36	101	89	101	107	121	134	120	125	123	97	89	28	1,271
D. Goudie .. .	.. ..	40	86	75	88	109	134	130	126	129	125	103	96	18	1,266

RECORD OF EGGS LAID—*continued.*

Owner		1913. April.	May.	June.	July.	August.	September.	October.	November.	December.	1914. January.	February.	March.	April.	Total.
S. Brundrett	White Leghorns ..	19	1	37	87	120	139	152	145	134	144	123	118	29	1,248
Gleadell Bros. ..	,, ,, ..	14	46	69	87	101	127	156	138	146	142	115	76	23	1,240
B. Mitchell	,, ,, ..	16	60	79	87	109	126	136	133	121	124	114	93	42	1,240
W. A. Rennie ..	,, ,, ..	32	41	38	106	107	129	147	136	140	133	103	103	21	1,236
A. Sellers	,, ,, ..	31	107	69	87	131	136	145	127	125	115	78	64	17	1,232
B. Rowlinson ..	,, ,, ..	27	83	81	77	108	128	144	122	128	117	83	91	30	1,219
T. S. Dallimore ..	Black Orpingtons ..	48	40	84	119	139	125	132	116	112	101	86	88	26	1,216
G. A. Gent	White Leghorns ..	47	54	57	73	127	120	155	138	136	128	92	72	16	1,215
Schaefer Bros. ..	,, ,, ..	15	11	73	103	123	137	152	140	136	123	116	81	3	1,213
Jas. Ogden	Black Orpingtons ..	15	6	46	67	115	145	154	143	143	133	95	118	28	1,208
J. Sinclair	White Leghorns ..	30	77	83	77	103	113	144	132	126	117	100	92	10	1,204
A. Stringer	,, ,, ..	15	15	68	118	135	142	154	132	125	104	79	83	23	1,193
S. Buscumb	,, ,, ..	32	76	69	89	110	128	129	117	131	133	91	76	6	1,187
Morgan and Watson ..	,, ,, ..	22	68	109	112	122	132	138	117	108	108	79	53	12	1,180
A. J. Jones	,, ,, ..	15	21	41	103	121	132	143	129	131	113	90	104	26	1,169
Cowan Bros.	,, ,, ..	30	98	32	103	123	140	140	119	116	98	70	83	11	1,169
Watson and Rushworth	Black Spanish ..	..	2	32	75	114	134	154	131	138	115	97	116	41	1,149
M. A. Monk .. .	White Leghorns ..	36	79	83	93	119	129	133	119	114	105	75	48	2	1,135
W. H. Steer	Black Spanish ..	1	30	44	110	124	130	140	126	118	113	97	88	7	1,128
T. W. Coto .. .	Black Orpingtons ..	56	113	102	114	115	106	113	97	84	72	52	80	13	1,117
A. Greenhalgh ..	,, ,, ..	43	63	58	50	112	143	129	116	122	95	84	63	25	1,103
P. H. Killeen ..	White Leghorns ..	32	39	73	105	119	119	110	110	115	107	79	81	13	1,102
Jas. McAllan	,, ,, ..	26	..	23	124	138	135	139	131	131	115	62	58	5	1,087
King and Watson ..	Black Orpingtons ..	17	84	86	109	121	107	113	100	92	90	66	67	26	1,078
C. L. Sharman ..	Golden Wyandottes	..	14	48	78	124	127	142	106	112	98	74	75	35	1,033
S. P. Giles	Rose-comb Brown Leghorns	16	45	71	84	97	103	114	113	103	109	93	62	2	1,016
Jas. Brigden	White Leghorns ..	4	16	14	66	104	127	135	113	120	112	98	81	7	997
E. Waldon	,, ,, ..	22	62	69	62	77	123	136	113	105	104	76	34	2	985
Sylvania Stud Farm ..	,, ,, ..	10	8	40	48	68	123	148	131	124	109	74	58	5	946
[illegible]		15	14	45	75	[illegible]	121	[illegible]	106	102	[illegible]	70	67	11	[illegible]

are included for heavy breeds. By a series of tests of this kind comparisons should be provided as to the relative egg-producing qualities of dry mash and wet mash, and the figures put up should furnish interesting facts for poultry-keepers. The whole of the pens (seventy in all) in the light breeds test are all white leghorns.

In the heavy breeds twenty-one pens contain black orpingtons, three white plymouth rocks, two Rhode Island reds, and one each red Sussex, barred plymouth rocks, buff wyandottes, and golden wyandottes respectively. The construction of thirty additional pens for the extra number of competing birds has now provided plenty of scope for the four tests, these are being constructed on different lines from the former, and they are a decided improvement in several ways. The houses have been made much larger and more commodious, and can now be utilized to keep the birds in during cold and wet weather, a condition which should have good results. Improved methods of both feeding and watering the birds have been effected. Feed hoppers on an improved pattern have been placed in the pens where dry mash is solely used. They are worked on an automatic principle, and no food can be wasted if they are kept in working order.

In conclusion, I would again point out the many benefits that the poultry industry has derived from the institution of these tests, and, should successful results attend the present test at Burnley, I would suggest that the Department might with advantage extend its operations in this respect.

The total number of eggs laid during the competition was 80,429; these were sold by contract at 1s. 2d. per dozen. The money return, consequently, was £390 19s. 6d.

QUALITY OF AGRICULTURAL SEEDS.

Before members of the Farmers Club at the Whitehall rooms, Hotel Metropole, London, Professor R. H. Biffen, of the Agricultural Department, Cambridge University, recently read a paper on the quality of agricultural seeds.

The paper was a lengthy one, and cannot be given in detail, but the author's main recommendations were compulsory guarantees and the installation of a seed-testing station. The discussion following the paper was interesting, in that several practical farmers and scientists aired their views.

Professor Percival stated that he had found seeds purchased from the man with a little black bag at the markets distinctly inferior to the seeds purchased from straightforward seedsmen. Mr. C. P. Hunter (Chester) considered that what was required to insure a high standard in the quality of seeds was certificated dispensers of seeds, and no one ignorant of their economic use should be permitted to handle the seeds. A minimum standard of purity and germination should be fixed. This, he held, would stop the sale of low-grade seeds.

Mr. O. D. Johnson (West Suffolk) regarded the suggestion of a seed-testing station, and the sale with a compulsory guarantee of purity and germination, as dangerous and injurious to the agricultural interest.

Professor Wrightson observed that he never had any satisfaction in buying seeds off his brother farmers.—Extracts from *Fertilisers*, 7th February, 1914.

SUGAR BEET.

FACTORY BY-PRODUCTS ON THE FARM.

One of the advantages gained by the beet-grower through his connexion with the factory is his knowledge of the value of factory by-products on the farm. The use of lime cake—the refuse of the filter press—as a fertilizer in sugar beet cultivation is recommended by all important authorities on the subject. An average analysis of factory lime cake is the following:—

	Per cent.
Calcium carbonate	87.30
Phosphoric acid	1.53
Potash	.11
Nitrogen	.30
Organic and undetermined matter	10.76
	100.00

The usefulness of lime as a fertilizer is threefold.

I.—CHEMICAL INFLUENCE OF LIME UPON THE SOIL.

(*a*) Lime takes care that the nitrogen supplied in the form of *ammonia is changed into nitrate. The plants are only able to receive* nitrogen in the form of nitrate. Where fertilizing with ammonia is customary, the supplying of lime is, therefore, an absolute necessity.

(*b*) Lime prevents the phosphoric acid entering into insoluble combinations with alumina (Al_2O_3) and iron by entering itself into combination with phosphoric acid which, while not readily soluble, is of a more soluble form than the phosphate of alumina, for instance.

(*c*) Lime forces the potash combinations which are hard to dissolve to a separation, combines with the salicylic, and sets the potash free for the sugar beet.

(*d*) Organic matter is also changed by lime into a form which is more readily assimilated by the growing plant

(*e*) Injurious iron combinations, especially protoxide salts, are *changed by lime into higher grades of oxidation which are not injurious* to the growth of the plant.

(*f*) *Finally, the lime serves to make a sour soil neutral or alkaline.*

II.—MECHANICAL INFLUENCE OF LIME.

(*a*) Lime is the best means to give to the soil the porous structure which is most favorable to the sugar beet.

(*b*) Lime regulates the *moisture* of the soil. Well-limed soil turns no water away, but absorbs it with avidity, and carries surplus water *to the subsoil. Tests have shown that soil free from* lime absorbs 53 per cent. water.

Soil with 8 per cent. lime content absorbs 66 per cent. water; soil with 16 per cent. lime content absorbs 78 per cent. water; soil with 24 per cent. lime content absorbs 87 per cent. water; soil with 32 per cent. lime content absorbs 96 cent. water; soil with 40 per cent. lime content absorbs 100 per cent. water. All the water supplied.

III.—PATHOLOGICAL INFLUENCE OF LIME.

Lime serves for the prevention and cure of beet diseases, for instance, root blight, rot, &c.

The principal varieties of lime used for fertilizing are slaked lime, quick lime, and the refuse lime of our sugar factories; the latter is especially suited because of the mineral substances contained in it.

Quick lime must be brought into the soil before winter sets in, while separator lime (press scum) may be applied as late as in the spring, though it would be advisable in this case also to fertilize before winter. Tests in regard to the quantity of lime to be applied have shown that sugar beets which received up to 25 tons of direct press scum per acre prospered best: beets from such soil were, at drawing time, five times as heavy as those which came from soil with low lime content. At drawing time, beets weighed in soils—

Without lime	0.28 gr.
With six tons per acre	0.87 gr.
With 25 tons per acre	1.43 gr.

At harvesting time the following figures were found:—

With 6 tons of lime, 137 gr. weight	15.8 per cent. sugar
With 12½ tons of lime, 230 gr. weight	16.0 per cent. sugar
With 25 tons of lime, 290 gr. weight	16.3 per cent. sugar

The favorable effect of lime is quite obvious from these tests on a small scale, and tests on a large scale, *i.e.*, in practice, have shown that from 7 to 10 tons per acre of dried press scum has given very favorable results.

BEET PULP AS STOCK FOOD.

While factory lime cake is thus of value to the farmer for use as a fertilizer, there are two other important by-products of the sugar factory, viz., beet pulp and molasses, that possess great value for feeding purposes. In Germany, France, Austria, and Russia sugar beet pulp is an article of commerce, as staple as corn. It is as much discussed in the agricultural press as sugar itself, and its feeding value is as well known and as highly appreciated as that of any of the coarse grains or fodders. Pulp as it comes from the factory is like turnips, mangold-wurtzels, rutabagas, and sugar beets themselves, a very succulent food. A farmer who takes a ton of beets to the factory and brings back a ton of pulp has really brought back as much feeding value as he has delivered, while the cost is only one-third to one-fifth of what it cost him to raise the beets.

The addition of sugar beet pulp to the ration of farm animals not only adds so much of nutriment; it materially aids digestion and increases the feeding and fattening value of other foods.

An experiment was made with several hundred steers thin in flesh; there was plenty of cheap pasture for grazing in the summer; the object was to carry through the winter with as little outlay as possible until pasture was available. The steers used in the experiment were divided into two lots, as much alike as possible. The first lot was fed a daily ration as follows:—Pulp, 55 lbs.; mixed hay, 8½ lbs.; shredded

corn stover, 4 lbs.; ground grain, 2.4 lbs. The daily ration of the second lot was—Mixed hay, 11.5 lbs.; shredded corn stover, 8 lbs.; grain, 11½ lbs. It will be noticed that the second lot was only fed grain and ordinary forage, while the first lot was fed with same and, in addition, sugar beet pulp. The results were as follow:—The lot of steers receiving pulp in their daily ration made an average daily gain of .684 lbs. Comparing the amount of food consumed by each pen to produce the net pounds gained, and computing from these data the value of a ton of pulp as an additional succulent food, the test shows that under the conditions existing a ton of pulp fed with other factors in the ration took the place of 421½ lbs. of corn stover, 274 lbs. of mixed hay, and 68.8 lbs. of grain.

The experiment station at Cornell, New York, conducted an experiment in order to ascertain the nutritive value of the dry matter in the pulp in comparison with the dry matter in corn ensilage. It was found that they were equal. An estimate of the production of California for 1904 was that the State would produce 928,400 tons of beets, or 464,200 tons of pulp. This pulp would feed 50,223 milch cows, or 100,466 steers, or 1,000,000 sheep.

The Michigan Experiment Station demonstrated that a ton of pulp would produce 41 lbs. of beef, live weight. At this rate the total annual pulp product of the United States would produce 67,000,000 lbs. of beef, worth, at 2½d. per lb., £700,625.

If, as demonstrated in a Michigan experiment, the addition of pulp to the ration produced, approximately, 8s. 5d. worth of beef for every ton of pulp fed, the feeding of pulp, costing 6s. 3d., will allow a profit of 33 1-3 per cent.

In feeding stock a farmer may have in view several things, as follows:—1. It is the scientist's province to study the changes in animal tissues and to inform the farmer as to the correct proportion of the different compounds of food required in building up the tissues. This feed must be furnished to the animal in proportion with which these various tissues are torn down; this is called a balanced food ration. 2. In case of feeding animals for the meat market it is the purpose to fatten and build up a carcass of meat filling the requirements of commerce. 3. It may be the purpose of the farmer simply to keep an animal in good healthful condition, without attempting to produce meat or dairy produce. 4. It may be the purpose to give the animal a strong healthful constitution and strong muscular tissues for performing work, as is accomplished with draught animals and other beasts of burden. 5. It may be the purpose to feed for the milk product.

Fortunate, indeed, is the farmer who is situated where he can secure fresh sugar beet pulp. For fattening, we have been too much inclined to a condensed ration largely made up of cereals, hay, and water, too dry and too compact, requiring too much of the digestive organs. Sugar beet pulp enters readily into any balanced ration designed for any specific purpose. No single item makes a food ration. This statement is as true of corn as it is of pulp.

MOLASSES FOR HORSES.

Besides pulp, whose feeding value is everywhere recognised as of great value, beet molasses is used very extensively in many quarters, especially for working horses.

In Germany, according to the *Scientific American*, dried peat is ground and sifted and mixed with molasses in the proportion of 25 per cent. peat and 75 per cent. molasses, obtained in the manufacture of sugar from beets. This product is guaranteed to contain 35 per cent. to 40 per cent. sugar. Horses fed with this develop a glossy coat, gain in appetite, and are free from colic. Neat cattle are said to become less subject to foot and mouth disease. The addition of 4.4 lbs. to the daily feed of milch cows is said to increase the daily yield of milk about 55-100 gallons.

In the Province of Hanover from 10,000 to 15,000 tons are used each year, while Germany, as a whole, consumes about 200,000 tons, or the equivalent of 33,000,000 gallons.

In this country (United States America) a perfect substitute for the peat would be leaves from the alfalfa, which shell off in handling; a mixture of molasses and alfalfa in this way in the right proportions would be ideal for cows, horses, and hogs, being a highly nutritious and cheap feed, taking the place of grain in value, at a very much less cost. As an illustration of the advantages of feeding molasses sprinkled on cut hay to horses working hard, the Lawrence Agricultural Company, of Los Alamitos, California, formerly had an expense of £25 per month for rolled barley; this, by the use of twelve barrels of molasses at 5s. 2½d., or £3 2s. 6d., was reduced to less than half. The hay used was Volunteer, cut in April, full of salt grass, weeds, and some burr clover. An experiment in feeding this weedy hay without the use of molasses showed that about one-half was wasted, making it impracticable to try to use it for a working team. It had been offered for sale at 8s. 4d. per ton, but was rejected. The method of feeding is to cut it up with a hay cutter, then sprinkle it with 3 quarts of molasses, diluted, over 20 lbs. hay per head per day, using together with the same about 7 lbs. rolled barley per head per day.

The result was that the horses, although continuing their hard work, not only held their own, but stood their work better than on grain, and are to-day sleek and in good spirits.

To summarize the cost of feeding twenty-three head of horses one month—

	£	s.	d.	£	s.	d.
Rolled barley, 4 tons, at £6 5s.	25	0	0			
Best barley hay, 10 tons at £2 10s.	25	0	0			
				50	0	0

Molasses combination.

	£	s.	d.	£	s.	d.
13,800 lbs. Volunteer hay, at 8s. 4d. per ton.. ..	2	17	6			
Cost cutting, at 5s. 2½d. per ton	2	3	2			
12 barrels molasses, at 5s. 2½d.	3	2	6			
2 tons rolled barley, at £6 5s.	12	10	0			
				20	13	0

Thus it is seen that the expense is reduced to less than one-half, while the rolled barley still is the greatest expense item.

—*The American Sugar Beet Growers' Annual.*

BEE-KEEPING IN VICTORIA

(Continued from page 313.)

By F. R. Beuhne, Bee Expert.

XXIV.—ROBBER BEES.

Robber bees are not a different kind or strain of bees, as some bee-keepers assume; they are merely bees which have discovered that it is easier to carry home honey, the finished product, than to fly long distances to collect the raw material, the nectar of flowers, which, after it is taken into the hive, has to undergo a process of concentration and a chemical change, brought about by the addition of a nitrogenous secretion from the body of the bee. It is the presence in honey of this nitrogenous matter (albumen) which causes the excitement and the inclination to sting when bees find honey somewhere instead of nectar. When the available supply is exhausted, the bees will search near and far for more, and as they are guided by the sense of smell the odour of honey attracts them to the entrances of other hives, or bees nests in trees, and finding some poorly defended stocks they enter and empty the combs of the last drop of honey. Becoming bolder, the robbers next attack stronger colonies, with the result that much fighting takes place, and many bees are lost by stinging. Robbing, as a rule, starts during a dearth of nectar, or a temporary break in the honey flow; but once bees have been robbing for some time they will continue, even when nectar is plentiful again, and it is about as difficult to cure them of the robbing habit as it is to break a dog of worrying sheep, or a hen of eating eggs.

CAUSES OF ROBBING.

There are quite a number of causes which develop the robbing habit in bees, the underlying factor in every instance, however, is that the bees find or scent honey instead of nectar. 1. Bees should on no account be allowed access to honey outside their own hive. The decimation of box hive bees over the larger part of Australia during the past 30 years is almost entirely due to the practice of letting the bees clean up rejected combs, sticky boxes, and utensils after the hives have been robbed of their contents. If one of the robbed hives happened to be diseased, many, or all the colonies, would get a share of the infected honey, while bees from trees or neighbouring farms would also take part, with the result that foul brood almost annihilated bees in some districts. 2. Feeding bees outside the hives during a dearth of nectar, or, indeed, at any time, is a bad practice, and frequently causes robbing to start. If it is necessary to feed it should be done inside the hive, a proper feeder being used, and sugar syrup given, not honey; the former is just as good as honey, is cheaper, safer, owing to the absence of possible disease germs, and does not excite the bees so much, as it does not contain any nitrogen. Even then it is best to give the syrup towards evening, so that bees from other hives may not be attracted. 3. Combs in hives, the walls of which are too thin, sometimes melt down in hot weather, and the honey running out, attracts bees from other hives. 4. Weak colonies, which are unable to guard the hive entrance efficiently, or queenless colonies, which will

admit strange bees, robbers included, without hindrance, may also, during a scarcity of nectar, cause an outbreak of robbing. 5. Unseasonable operations are frequently the cause of robbing. Shaking the bees off the combs in front of the hive instead of into the hive, and thus spilling thin honey on the ground, extracting honey in the open air, or in a non-bee proof room, and returning extracted combs to the hives, are all operations which are quite harmless during a honey flow, but which, after a change in the weather, may create quite an uproar in the apiary. The secretion of nectar by the blossoms sometimes suddenly ceases when extracting still has to be done, and it is, therefore, best to have a bee-proof place to extract in, to shake the bees off the combs into the hives, and not to put the extracted combs out till towards evening.

RESULTS OF ROBBING.

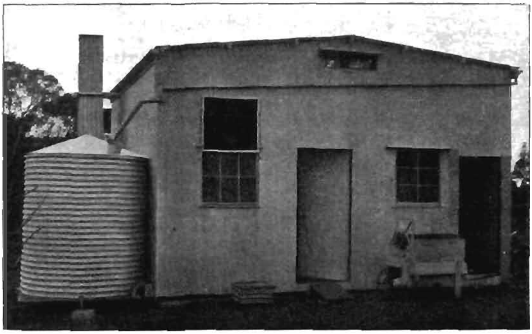
It has already been stated that robbing has caused, and, it may be added, is still causing the wholesale spread of the diseases of bees, and while the loss of many colonies from foul brood is the most deplorable of the results, there are others, some of which are annoying, while others add expense to the running of an apiary, or reduce the returns. Robbing is almost invariably accompanied by the stinging of man and beast in the vicinity of the hives, while sometimes the actual loss of bees stung to death is considerable.

When an apiary has become demoralized through robbing, even bees, which, by mistake or on account of strong winds, enter the wrong hive are stung to death, when under ordinary conditions they would be accepted. It is stated in some bee books that every bee knows its hive, but every careful observer who has kept several distinct races of bees in the same apiary knows that there is considerable straying of bees from hive to hive. In a demoralized apiary, every strange bee entering a hive is stung, and large numbers of dead bees may be seen in front of every hive long after actual robbing has ceased. Further, when bees are in this state of irritation they will sometimes ball their own queen, or, if a virgin, cripple her so that she is unable to take her mating flight, or destroy her altogether, so that the colony becomes queenless, and a further inducement to create robbing. At such times attempts to introduce new queens are sure to result in failure, the owner of the bees being at a loss how to account for it.

PREVENTION OF ROBBING.

In regard to robbing, as in other things, prevention is better than cure. If the extent to which bee-keeping is carried on does not justify the erection of a special bee-proof extracting house, at least a place should be set apart which can be made bee tight in which to carry out all the operations of uncapping, extracting, and tinning of honey, and to store combs, wax, and appliances. Even a tent may, with little trouble, be made bee-proof. For the specialist bee-keeper, a properly constructed honey house is an absolute necessity, and a good investment, as it enables him to catch up with the work of extracting during short breaks in the honey flow, when otherwise he could not do so without demoralizing the bees. When more than twenty hives are kept, a wheelbarrow constructed on the lines of that shown in the illustration, carrying four supers of combs, will save much time and hard work, and at the

same time exclude the bees from the combs during the taking of the combs from the hives and on the way to the extractor. This is accomplished by having a board the size of the hive body, with a rim round the edge, on the barrow to catch any drips of honey, and a light cover on top, which is raised and dropped again every time a comb is inserted. If robbers are very persistent, and try to rush the combs every time the cover is raised, they may be circumvented by using two smokers, one at the hive, while the other, with the top open, is placed on the ground inside a hive body, another body is placed on top, into which the combs are hung as they are taken off the hive; no cover is needed, as the smoke rising between the combs keeps the robbers away. When the box is full it is lifted on to the barrow and covered up. In this way honey may be taken off and extracted at times when it would be impossible to do it in the ordinary way without starting robbing, stinging, and general confusion amongst the bees.



Bee-proof Honey House and Hive Barrow.

Water in which sticky utensils have been washed, or the water used in boiling up old combs or beeswax, should be buried, while the refuse from the wax press, or the bag in which wax has been boiled under water, should be burned. The exercise of these precautions will keep the largest apiaries in a normal state, and enable all work to be done in peace and comfort.

To Stop Robbing.

When robbing has only just commenced it may often be stopped. If a weak hive is being attacked, the entrance should be contracted, to give the defenders a better chance of repelling robbers. If robbers are hovering round or bunching on the crevices between the lower and upper story, a little kerosene or carbolic acid applied to the wood with a brush will cause them to desist. If contracting a hive entrance is not effective, the same remedy may be applied, taking care not to put it too close to the entrance. The uninitiated often find it difficult to distinguish robbers from the bees belonging to the hive, and it may here be pointed out that

a robber is easily recognised by the way it carries the third pair of legs while on the wing. Ordinarily, the hinder legs are not very noticeable on a bee in flight; on a robber bee they are very conspicuous, being extended full length backwards and outwards. When robbing has only just started, the robbers may all come from one or two hives. To discover from which, put some flour in the entrance of the hive that is being robbed, and then walk round the other hives and look for returning flour-bedaubed bees. If it is only a case of one colony robbing another, changing the places of the two hives will confound the robbers and restore order.

(*To be continued.*)

EEL WORMS.

W. Laidlaw, B.Sc., Micro-Biologist.

(This article appeared as an appendix to Mr. D. McAlpine's *Handbook of Fungus Diseases of the Potato in Australia and their Treatment.*

The *Anguillulidæ* to which eel-worms belong, are one of the families of the *Nematoda*, a sub-order of the *Nemathelminthes*. The *Nematoda* are a most important group of worms, for not only do we find in it those worms which attack plants, but we also find many attacking man, the domesticated and wild animals, birds, reptiles, and insects. There is scarcely any living thing which may not be attacked by them, and immense losses from death and disease are caused by their ravages. Most of the parasitic ones spend a part of their existence as free living animals; many spend their whole life in decaying vegetable matter or damp earth; while a few spend the whole of their existence in the bodies of their hosts.

ANATOMY.

There are a great many species in the order, the determination of which is a matter of very great difficulty, for there is very little difference in their structure however much they may vary in their food and habits. None of the worms are segmented, *i.e.*, "their bodies are not divided into a number of segments which serially repeat each other, and which resemble, more or less closely, the preceding and succeeding parts." They possess a few bristles or booklets, but have no limbs or other appendages. The body is elongated, round, and tapering at the ends. The head end is truncated, and less pointed than the tail, which is usually exceedingly slender.

All the *Nematoda* are diœcious, *i.e.*, the male and female reproductive organs are in different individuals. The young, which are usually termed larvæ, do not differ much from the adults, except in size, and the absence of sexual organs. They are usually free living.

CIRCULATORY SYSTEM.

There is no closed vascular system, but it is probable that the clear colourless fluid contained in the cavity between the intestine and the body wall, and by which the various organs are bathed, is the blood.

RESPIRATORY SYSTEM.

There are no lungs, and, although we know a certain amount of respiration is necessary for the life processes of the worms, we do not know how it is carried on. It may be that the lateral pores have a respiratory function.

CILIA.

The presence or absence of cilia is a disputed point. I have not been able to make out these small processes of the cells. If none are present, it is rather remarkable, for they are universally present, from man down to the most lowly unicellular organism. "In many animals they are the sole organs of locomotion, and in almost all they perform most important functions, both in bringing food to the body and in removing waste matters from it."

SKIN.

The skin is smooth, thick, and transparent. It lines the various apertures and tubes of the body for a greater or less distance, and consists of three layers—(1) the cuticle, (2) the subcuticle, and (3) the muscular layer. The cuticle is a secretion of the subcuticle, and lies outside it. Under the subcuticle and surrounded by it is the muscular layer.

The nature of the subcuticle is one of the debatable points in the histology of the *Nematoda*. Although nuclei are scattered through it, no cell outlines can be made out. It is a syncytium or protoplasmic mass in which the cell outlines cannot be distinguished. A close network is formed from the breaking down of the cells into fibrils which are specialized round the nerve cords. This tissue is heaped up around the dorsal, ventral, and lateral lines, and divides the enclosed muscle cells into four quadrants. In the dorsal and ventral thickenings are specialized nerve cords, and, in the lateral thickenings, lie the excretory canals.

NERVOUS SYSTEM.

According to Jammes, the nerve tissue is of the same nature as the subcuticular tissue, only more differentiated, or, rather, it has retained more of the cellular character of embryonic tissue.

The central organ of the nervous system is the circumœsophageal ring which surrounds the pharynx close to the anterior end of the body. There are a few ganglion cells in the ring aggregated round the points of origin of the nerves. Nerves run forward towards the mouth, and, running backwards, there are six main trunks, the dorsal and ventral being the largest. As before stated, these run in the median, dorsal, and ventral thickenings of the subcuticular tissue, and are connected, one with another, by fine lateral branches running through the subcuticle. So far as I know, there is nothing peculiar in the histology of the nervous system.

MUSCULAR SYSTEM.

If we make a transverse section of a nematode, we will see numerous muscle cells lining the subcuticle, except where the dorsal, ventral, and lateral thickenings are. The muscle cells are spindle shaped and of considerable size. There is a contractile portion next to the subcuticle, consisting of a number of columns in two regular rows. The medullary

half which projects into the body cavity consists of a fibrillar spongioplasm filled with a clear hyaloplasm without structure. The medullary portion contains the nucleus.

The fibrils of the spongioplasm fill up the spaces between the contractile columns and are continuous with the fibrils of the subticle. Special muscles are found at the different orifices of the body.

BODY CAVITY.

As mentioned previously, the skin contains, in its thickness, the muscular, nervous, and excretory systems, and within it lies the body cavity, in which we find the digestive and reproductive systems. There are no mesenteries dividing the body cavity into compartments. It contains a colourless coagulable fluid with many corpuscles, which probably act as carriers of oxygen, though nematodes seem to require very little of that gas, their life processes being slow. Bunge found that certain parasitic species lived from four to six days in a fluid free from oxygen.

DIGESTIVE SYSTEM.

The mouth is anterior and terminal, and leads into an alimentary canal which runs straight through the body to the anus, which is situated on the ventral side of the body and is not terminal. This simple tube may be divided into three main parts—the œsophagus, the intestine, and the rectum. The œsophagus extends from the mouth to the intestine. It is triangular in section, lined with cuticle continuous with the skin covering the body, and, like it, is shed at the various moults. Its walls are thick and muscular, and it has as its posterior end a bulbous swelling adapted for a special purpose. It is armed with a spear in the species under consideration. The spear is used to pierce the tissues of the plant upon which the animal lives. A small gland, supposed to be salivary, lies in the thick wall of the œsophagus, and opens into its lumen by a fine tube.

The intestine, into which the œsophagus opens posteriorly, is a simple tube, made up of a single layer of nucleated columnar cells. The internal wall has a coat of a chitinous nature which has many minute pores. The rectum is short, and its cuticular lining, like that of the œsophagus, is cast at intervals. The rectum possesses a sphincter.

EXCRETORY SYSTEM.

The excretory system consists of two canals embedded in the lateral thickenings of the subcuticular tissue. They end blindly behind, but anteriorly they bend downwards and open by a common pore on the ventral surface near the head. They contain a fluid, but nothing is known of its composition. Cobb supposes it to be urinary in its nature.

REPRODUCTIVE ORGANS.

The sexes are distinct, the males being smaller than the females. The genital opening in the female is ventral and near the middle of the body; while, in the male, the anus serves for the genital opening as well as for getting rid of the excrement. The male has a genital bursa and one or more spicules at or near the cloaca.

The internal organs in the male consist usually of a single tube, which we may divide into a testis, a vasdeferens, a vesicula seminalis, and an ejaculatory duct.

In the testis the protoplasmic granules enlarge and become elongated cells (mother cells), which group themselves about longitudinal axes or rachises. There may be as many as ten of these axes. As these mother cells mature they become detached from each other, and so give rise to the spermatozoa. The spermatozoon of a nematode has no flagellum; and, though it cannot move actively, it has a well-defined amoeboid movement. The spermatozoa do not become mature till they reach the uterus of the female.

The internal reproductive organs of the female are double, and consist of ovaries, oviducts, and uteri. The vagina is single, and is lined by a continuation of the cuticle covering the body. The ova arise from the germinal epithelium at the blind ends of the ovaries, and, as they get pushed forwards into the tubular part, they enlarge and arrange themselves around a central axis or rachis, which seems to be formed by the coalescing of the ends of the cells. In the small free living forms there is no rachis. The ovum has a cell-wall enclosing a reticulated protoplasm with nucleus and one or more nucleoli. After copulation, the spermatozoa collect in the ovary close to the uterus, and here the ovum is fertilized. After fertilization, the egg acquires a

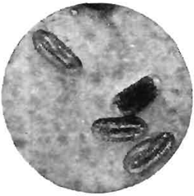


Plate 1.—Eggs of Potato Eel Worm x 120.

shell which is probably deposited around it from the semi-fluid contents of the uterus. The shell is chitinous and very resistant to chemicals. Drying or soaking in water has no effect on it. In some species it is provided with a process which enables the embryo to escape, one end coming off like a little lid or cap.

The eggs differ greatly in their rate of development, karyokinesis going on much more rapidly in some than in others. This is probably, in a great measure, due to the artificial conditions under which the observations are made. Eggs that have been dried for months and then moistened, hatch out, the embryos showing movement within the egg in less than two days. Each female worm produces from 250 to 300 eggs. As the life cycle is complete in three weeks or so, and, as there are ten or more generations in the year, it is not difficult to understand the spread of the pest.

The foregoing description of the *Nematoda* applies also to the genera which attack plants, viz., *Tylenchus, Aphelenchus,* and *Heterodera.*

Heterodera radicicola, the potato eel-worm, is about one-twenty-fifth of an inch in length, being just visible to the naked eye. It causes swellings or blisters on the tubers, which often break down, causing scablike blemishes on the skin.

CYSTS.

If we take a potato showing these swellings or blisters, and cut it at right angles to the surface, we will find, under the skin, at depths varying from 1-32 to ½ of an inch, little rounded cysts which are quite visible to the naked eye, being about the size of a pinhead. These are the female worms which have become distended with eggs. In a potato that is newly dug, the little cysts are transparent and very difficult to make out with the naked eye; but, in one that has been kept for some time, they are easily seen as the cyst becomes opaque and pearly-white in appearance, and by-and-by some of the starch cells in the neighbourhood become brownish through degeneration. In a potato that has been dug for some time the cysts are easily removed for the purpose of observation, the wall of the cyst, which is really the epidermis of the worm, having become tougher with age. If we place an individual cyst in water it swells up by osmosis, and usually a portion of the contents is expressed. From the contained eggs, living worms are hatched out in eight days. This, no doubt, is slower than it will be in natural conditions, owing to the difficulty of keeping the eggs with just the requisite amount of moisture.

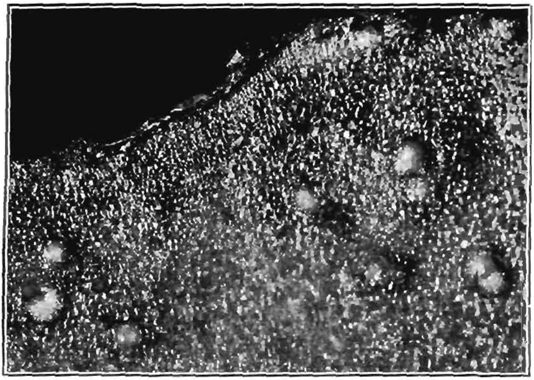


Plate 2.—Section of Potato, showing cysts x 10.

LIFE HISTORY.

The usual life cycle of the potato worm is quite simple. When a potato with blister, *i.e.*, with the female in the cystic form, is planted, the embryo worms are set free in the decaying set, through the rupturing of the body of the adult. These find their way into the soil, where they live till they are sexually mature. Conjunction of the sexes takes place, and the females bore their way into the young potatoes of the new crop there to encyst themselves again.

The accompanying micro-photograph shows the female at the commencement of the cystic stage.

It must be borne in mind that this worm can pass through its whole life cycle without becoming encysted in a tuber, as it is able to live in the decaying vegetable matter in the soil. In this case the female does not become distended with eggs, fewer being produced.

To obtain a pure culture of the potato worms, an infected potato was washed and placed in sterilized soil. After a time the worms were collected from the soil and decaying set, care having been taken during the period of growth to water with nematode-free water. By feeding the worms on small pieces of boiled potato and onion, I was able to keep them alive and healthy. They went through their whole life cycle in the free state, and slowly increased in numbers. The females did not become "citron shaped," and were quite as active as the males. No non-motile larvæ were observed.

The damage to a crop is mainly caused by the females, sexually mature males being seldom found in the tissues of a potato.

When a culture of potato worms is kept for some time, little white dots, the size of a small pin's head, will be found on the sides of the dish, quite away from the food and moisture. On removing one of

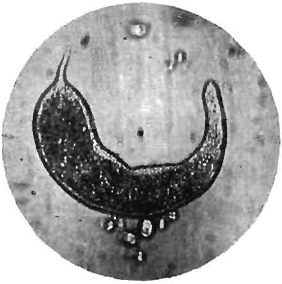


Plate 3.—Female Worm at the commencement of the cystic stage x 160.

these small clumps to a microscopic slide and moistening it with water, it will be found to consist of a mass of worms of all sizes, except the smallest larvæ, though there are, as a rule, very few sexually mature adults.

I allowed one of these dishes to dry up completely, and kept it so for over twelve months. At the end of that time I took one of the little dried-up clumps and placed it on a slide with some water, and, in a few hours, the worms were moving about in a lively manner. This gathering into clumps may be adopted by the worms as a means of preservation, for it is generally seen when the food supplies or the moisture in the dishes are becoming low. Or this massing together may be a means of enabling a colony of young and vigorous worms to be transported more readily from place to place by the agency of animals, birds, insects, &c.

CHANGES IN THE FOOD SUPPLY.

All the groups are, to a certain extent, restricted in their choice of food. When their natural nutriment is withheld and something else substituted, they become sluggish, reproduction ceases, and many of the worms die before they are able to adapt themselves to the change. These facts point strongly to the advantages to be gained by rotation of crops.

SAPROPHYTIC WORMS.

Minute nematodes abound in moist soil, around the roots of plants, and in decaying vegetable matter. They are not directly parasitic in plants, and, so far as is known, do no harm. As many as six different genera have been found in the blemishes on the skin of a damaged potato, and, in some cases, not a single one of them belonged to the family *Heterodera.*

I have never succeeded in keeping worms alive for longer than three or four days that did not belong to the families *Tylenchus, Aphelenchus,* or *Heterodera;* and this, with the anatomic differences, to my mind, proves that many of the worms regarded as injurious are merely saprophytic.

In soil sterilized by steam for two hours I planted very scabby potatoes containing nematodes in the blemishes on the skin, but no cysts. Previous to planting, the tubers, with the exception of the control, were steeped in 1-300 formalin. When dug, the tubers showed no trace of "scab." All of those from the unsteeped "set" showed more or less scab. The same procedure was carried out with potatoes having eel-worm cysts; and, in every case, steeped and unsteeped, eel-worm was found in the young crop.

Scientists do not agree in their statements with regard to eel-worm, one remarking that "Though eel-worms are almost universally considered as doing great injury to cultivated plants, and in all probability such is the case, yet I have often wondered whether they are always the primary cause of mischief. Experience has taught me to always look for fungus mycelium when I cut an eel-worm gall, and I am rarely disappointed"; while another says that "The fungus is always secondary, the primary damage being caused by the eel-worm."

For my own part, I consider both are right and both wrong; for I have examined many plants where the primary, and, indeed, the only affection was due to the eel-worm, and I have examined quite as many where the eel-worms found were mere saprophytes living in the decaying tissues of the plant, the primary damage having been caused by some other agency.

TREATMENT.

Various remedies have been tried, such as saturating the soil with carbolic 1 in 20; gas lime spread on the soil and intimately mixed with it; mixing naphthaline with the soil; and sulphate of potash, 4 cwt. to the acre. I have had good results with both carbolic acid and naphthaline, but they are too expensive to use over large areas.

Experiments are at present being carried on by this Department for the eradication of the pest; and, though they appear very successful, it is too early in the season to speak positively.

In using any insecticide, it must be applied three times, a fortnight intervening between each application; the reason for this is that the *eggs hatch out in from eight to ten days in favorable circumstances.* The first application kills off the adult worms, and the succeeding ones kill the worms hatched out from the eggs already in the soil.

A dressing of peaty soil was tried on onion eel-worm infested soil at Portarlington, with no result.

Steeping seed potatoes in formalin or corrosive sublimate is of no avail. The chemicals do not penetrate deeply enough to reach the cysts, and, did it reach them, it would not kill the eggs, the envelopes being very resistant to all kinds of chemicals.

Growing the same crop year after year on the same ground is the greatest cause of the soil becoming infested with eel-worm. They can live on a great many plants cultivated and uncultivated, but they can only change from one kind of plant food to another with difficulty. Hence, when rotation of crops is practised, the worms never become a serious menace to the farmer.

In selecting seed for planting, the grower must see that it is free from "blisters" or galls, rejecting all that are in the least suspicious, for, unless a potato is badly affected, the infection is not easily seen.

THE Romans knew that clover enriched the land. Nobody knew why. In 1886 two German investigators showed that leguminous plants could use free nitrogen by the help of a bacterium living in their roots.

THE relative value of the manure produced by different foods is determined chiefly by the nitrogen (protein) which they contain.

DESTINATION, QUANTITIES, AND VALUES OF OVERSEA EXPORTS THROUGH COOL STORES.—QUARTER ENDED 30TH MARCH, 1914.

Description of Produce.		United Kingdom.		South Africa.		Other Ports.		Total.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
			£		£		£		£
Butter ..	lbs.	6,560,438	322,165	253,086	12,430	776,528	38,134	7,590,052	372,729
Cheese ..	,,	530,256	13,257	240	6	4,423	110	534,919	13,373
Milk and Cream	,,	294,500	3,534	..	..	173,700	4,342	468,200	7,876
Ham and Bacon	,,	2,736	137	2,250	113	13,956	698	18,942	948
Poultry and Game	head	..	..	1,000	150	670	350	1,670	500
Rabbits and Hares	pairs	220,488	9,187	600	25	8,944	373	230,032	9,585
Mutton and Lamb	lbs.	44,630,000	446,300	..	..	570,800	5,708	45,200,800	452,008
Meat Sundries ..	lbs.	626,972	2,583	..	..	..	..	626,972	2,583
Beef	,,	15,630,000	195,367	..	..	914,200	11,426	16,544,200	206,793
Veal	,,	114,200	1,713	27,100	406	304,300	4,565	445,600	6,684
Pork	,,	..	..	..	..	4,200	105	4,200	105
Fruit ..	bushels	105,786	52,893	156	78	182,984	91,492	288,926	144,463
Pulp	lbs.	..	..	..	..	78,400	990	78,400	990
		..	1,047,136	..	13,208	..	158,293	..	1,218,637

R. CROWE,
Exports Superintendent.

FEEDING EXPERIMENTS WITH RUBBER SEED CAKE.

Details of feeding experiments with pressed cake from Para rubber seed appear in the current issue of the *Bulletin* of the Imperial Institute.

ANALYSIS.

	Rubber Seed Cake.	Linseed Cake.
Moisture	6.91 per cent.	11.20
Crude proteins	29.93 ,,	29.50
Fat	17.68 ,,	9.50
Starch, &c.	35.97 ,,	35.54
Fibre	4.82 ,,	9.10
Ash	4.69 ,,	5.20

The ash of the rubber seed contained 5.03 per cent. lime, 33.52 of phosphoric acid, and 34.89 per cent. of potash.

Analyses of other samples show the rubber seed cake comparing very favorably with linseed cake.

The results of various feeding tests are given, and the report concludes, "Para rubber seed cake thus appears to be a valuable fattening food for cows, producing very satisfactory increases in weight in mature animals, and giving rise to no ill effects when the feeding was continued for a considerable time."—Extracts from *Fertilisers*, 7th February, 1914.

NEW POTASH FERTILISER.

It is reported from Iceland that a German firm has now under construction a factory at Haffradir, in the neighbourhood of Reykjavik, for the manufacture of a new fertilising material with potassium as its chief component.

The raw material consists of a kind of potassium feldspar, resembling lava, which will be reduced in electrical furnaces together with coal and iron. The products from these furnaces are of two kinds, viz., a silicious iron, which is saleable to steel works, and a potassium slag, which is first subjected to a crushing process, and then brought into the market, under the name of Elektro-Kalium, as a manure.

The process was invented by a Swedish engineer, Mr. Axel Lindblad, who has a factory of his own in Sweden, viz., the Sausta Electrical Melting Works at the Hägge station.

Elektro-Kalium is not to be confused with the material that has been brought into the market in Germany under the name of feldspar flour, which is merely crushed feldspar.—*Fertilisers*, 7th February, 1914.

Potash manures are largely availed of by orchardists in various parts of the State, and although the above manure is not on the local market at present it is sure to make its appearance, especially as the products of electrical power tend towards cheapness, and therefore this note may be interesting.

IN 1879 the first successful cream separator was devised by the Swedish engineer, Dr. de Laval.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Commencing 15th April, 1914.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

Pen.	Breed.	Owner.	Total to 14th May, 1914.	Position in Competition.
		LIGHT BREEDS.		
		WET MASH.		
9	White Leghorns ..	J. J. West	150	1
36	.. ..	E. A. Lawson	137	2
25	.. ..	J. H. Gill	130	3
10	.. ..	R. Hay	122	4
45	.. ..	H. C. Brock	119	5
3	.. ..	T. A. Pettigrove ..	117	6
19	.. ..	Marvelle Poultry Farm ..	115	} 7
16	.. ..	A. R. Simon	115	
26	.. ..	Mrs. H. Stevenson	112	} 9
17	.. ..	F. Doldissen	112	
23	.. ..	S. Buscumb	99	} 11
44	.. ..	A. Ross	99	
37	.. ..	S. Brown	97	13
11	.. ..	C. J. Jackson	91	14
35	.. ..	W. Tatterson	90	15
4	.. ..	Giddy and Son	85	} 16
22	.. ..	B. Mitchell	85	
33	.. ..	W. G. Osborne	85	
1	.. ..	F. G. O'Bree	78	19
31	.. ..	E. H. Bridge	77	} 20
24	.. ..	C. Pyke	77	
2	.. ..	J. C. Armstrong ..	76	} 22
12	.. ..	A. H. Mould	76	
40	.. ..	J. Schwabb	75	24
49	.. ..	A. Beer	68	} 25
6	.. ..	C. R. Jones	68	
28	.. ..	Utility Poultry Farm ..	68	
18	.. ..	All-lay Poultry Farm ..	66	28
29	.. ..	V. Little	65	29
42	.. ..	E. W. Hippe	64	30
34	.. ..	W. A. Rennie	60	31
30	.. ..	G. W. Robbins	54	32
8	.. ..	F. W. Brine	53	33
47	.. ..	W. G. Swift	50	34
38	.. ..	G. Hayman	48	35
21	.. ..	R. A. Lewis	45	36
46	.. ..	C. L. Sharman	44	37
13	.. ..	H. Hanbury	43	38
39	.. ..	R. L. Appleford ..	42	39
20	.. ..	A. W. Hall	36	40
7	.. ..	B. Cohen	34	41
41	.. ..	Doncaster Poultry Farm	32	} 42
43	.. ..	G. Mayberry	32	
15	.. ..	E. Waldon	31	44
50	.. ..	F. W. Silbereisen ..	27	45
5	.. ..	A. Mowatt	26	46
32	.. ..	Gleadell Bros.	24	48
48	.. ..	Bennett and Chapman ..	23	47
27	.. ..	Walter M. Bayles ..	3	49
14	.. ..	F. C. Western	..	50
		Total	3,525	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915—*continued.*

Pen.	Breed.	Owner	Total to 14th May, 1914.	Position in Competition.
		LIGHT BREEDS—*continued.*		
		DRY MASH.		
60	White Leghorns ..	W. M. O'Mullane	114	1
58	" ..	*Miss L. Stewart* ..	*112*	2
53	" ..	C. Lawson ..	107	3
55	" ..	E. A. Lawson ..	89	4
68	" ..	E. W. Hippe ..	78	5
69	" ..	C. J. Beatty ..	76	6
59	" ..	F. G. Silbereisen	72	7
64	" ..	E. A. Carne ..	71	8
62	" ..	A. Greenhalgh ..	59	9
65	" ..	*W. G. Osborne* ..	*58*	*10*
51	" ..	Moritz Bros. ..	55	11
57	" ..	J. Jackson ..	50	12
61	" ..	H. Hanbury ..	40	13
52	" ..	Myola Poultry Farm	28	14
70	" ..	W. H. Robbins	24	15
66	" ..	S. Brown ..	22	16
67	" ..	Walter M. Bayles	21	17
63	" ..	Hanslow Bros. ..	20	18
56	" ..	R. C. Buchan ..	5	19
54	" ..	G. Carter ..	2	20
		Total ..	1,103	
		HEAVY BREEDS.		
		WET MASH.		
81	*Black Orpingtons* ..	*D. Fisher* ..	*120*	1
77	" ..	J. McAllan ..	115	2
84	Rhode Island Reds	J. Mulgrove ..	108	3
82	Black Orpingtons ..	J. H. Wright ..	103	4
78	Red Sussex ..	Jorgen Anderson	99	5
71	*Black Orpingtons* ..	J. Ogden ..	89	6
87	" ..	A. Douglas ..	83	7
72	" ..	T. W. Coto ..	72	8
88	" ..	*H. H. Pump* ..	*71*	*9*
75	" ..	Fairdeal Poultry Farm	65	10
73	" ..	J. A. McKinnon	62	11
76	" ..	W. P. Eckermann	58	12
74	" ..	S. Brown ..	57	13
89	" ..	*Marvelle Poultry Farm*	52	14
83	" ..	Cowan Bros. ..	37	15
86	Buff Wyandottes ..	W. G. Swift ..	33	16
85	Golden Wyandottes	*J. C. Mickleburg*	19	17
80	White Plyth Rocks	Stranks Bros. ..	1	18
79	Barred Plyth. Rocks	Bennett and Chapman	..	19
		Total ..	1,244	
		DRY MASH.		
100	Black Orpingtons ..	D. Fisher ..	123	1
94	" ..	T. W. Coto ..	113	2
98	" ..	*A. Greenhalgh* ..	*85*	3
91	" ..	C. E. Graham ..	51	4
92	" ..	Fairdeal Poultry Farm	46	5
97	" ..	J. McAllan ..	39	6
90	" ..	J. H. Wright ..	18	7
96	Rhode Island Reds	Myola Poultry Farm	11	8
93	Black Orpingtons ..	" " "	4	9
95	White Plyth. Rocks	C. L. Hewitt ..	..	10
99	" ..	*Mrs. G. R. Bald*	..	*11*
		Total ..	490	

A. HART,
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Department of Agriculture,
Melbourne.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

PLANTING.

The time has now arrived when the general planting of deciduous fruit trees will take place. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. Certainly, to insure satisfactory results, the orchard must be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way; while walnuts, owing to their spreading habit, require a distance of 30 feet each way.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes are dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows, filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed, shaped to an even form, and cleanly cut. As a result of their removal from the nursery beds, the roots are generally more or less damaged; and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting the top should be cut well back, so as to leave three or four arms, with three or four buds on each. Where it is not possible to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some localities, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be unadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system.

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

SPRAYING.

The dry season has been favorable to the increase of certain scale insects, woolly aphis, and the bryobia mite in some localities. The use

of red oil has been advocated for these pests; and, as well, crude petroleum, kerosene, and other oil emulsions have proved satisfactory. Some years ago the use of lime, sulphur, and salt spray was much in vogue as a winter spray. Owing, however, to the difficulty of preparing the spray, and to its caustic effect on the skin, it was practically abandoned as an insecticide. Even then it was claimed, and rightly so, that the spray was, to a certain extent, a very good fungicide. The use of this mixture as a winter wash, with the omission of the salt, which has been found to be an unnecessary ingredient, is being revived; and as the lime-sulphur wash is now on the market in the form of proprietary mixtures, it is likely that this spray will again become popular. It is searching in its action, very adhesive, and certainly effective. Its claims, too, as a fungicide are not without foundation, as some years ago, when used in orchards on peach trees for scale insect troubles, it was subsequently found that the trees were very much more free from leaf curl and shot hole than during previous seasons.

It possesses objectionable features in its corrosive effects upon any iron or steel on pumps and harness; and in its caustic effects on exposed parts of the body. These may be somewhat obviated by greasing the metal, and rubbing the hands and face with olive oil or vaseline prior to spraying. The hindquarters of the horse, too, should be covered with a sack.

Experiments carried out in Pennsylvania in 1909 proved conclusively that, in addition to being an excellent insecticide, it was considerably helpful in reducing the effects of fungus diseases on apples, pears, cherries, peaches, and plums.

GENERAL WORK.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out This, too, should be finished before spraying and pruning. Before spraying with oils or with lime-sulphur wash, all rough bark on apple and pear trees should be scraped off; this will mean the certain destruction of any codlin moth larvæ hiding underneath.

Flower Garden.

General cleaning up and digging will be the work for this month in flower section and shrubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, giving a fair dusting all over the surface. Lime should not be used in conjunction with leaves, garden débris, leafmould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top-dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up gardens, all light litter and foliage should be either dug in, or, better still, it should be placed in an out-of-the-way corner to form a compost heap. Leafmould, well rotted, is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves, unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wallflowers, &c., and cuttings of roses and hardwood shrubs may also be planted. In planting out cuttings it is very important that all the eyes should be removed from the part of the cutting which is to be below the ground. If this be not done, there will always be the subsequent danger of the plant suckering.

Roses and any summer and autumn flowering shrubs that have finished flowering may be pruned. If the spring flowering shrubs have not previously been pruned, they should be allowed to remain until after the next flowering season. This especially applies to such plants as Spireas, Philadelphus (Mock Orange), Deutzia, Prunus, Mumé, and other early flowering shrubs. To prune these now would mean the certain loss of a great proportion of their flowers.

In pruning, the shrubs may be well thinned out, especially removing any weak upright or old flowering growths; keep the shrub always at an outward growth, inclining to a broad bushy type, instead of to an upright habit. By this means, the lower regions will always be furnished with good growth. Shrubs and trees of all descriptions should never be allowed to become too crowded; they require to be opened, so as to allow sunlight and air into the interior, where it is most needed. This is one means by which this class of plants may be kept healthy and free from disease. Very few shrubs resent pruning, and the majority of them, including Australian shrubs, such as Acacias, are very amenable to the pruning knife.

In rose pruning, the rule is that strong-growing plants require less severe cutting than the weak-growing ones. As roses always flower on new wood, it is essential that to have good blooms the bushes must be pruned regularly. All weak growths, exhausted and worn-out wood, must be removed, retaining only vigorous growths. It is generally advisable to always prune to four or five eyes or buds, so as to have subsequent strong growths, always pruning into the previous season's wood. Spindly growths, especially in the centres of the bushes, should be removed, the plants being trained with on open and angular habit.

To prevent loss by decay, it will be advisable to lift and store such herbaceous plants as delphiniums, perennial phlox, rudbeckias, &c., also dahlia tubers, chrysanthemums, cannas, and perennial sunflowers and asters. Failing the possibility of doing this, they should be lifted gently with a fork, so as to allow of a slight air space under the crown.

Vegetable Garden.

If not previously done, asparagus beds should be well cleaned out, and a top-dressing of manure given. To insure good drainage, the soil from the paths, or between the beds, may be thrown up on to the beds, so as to deepen the surface drainage, and to consequently warm the beds. This will mean earlier growths. A heavy dressing of manure should be given, and the beds well and roughly dug over.

Plant out seeds of tomatoes and the pumpkin family in the frames; and sow in the open seeds of peas, lettuce, spinach, broad beans, raddish, onions, carrot, and leek. Asparagus crowns, rhubarb roots, tubers of Jerusalem artichokes, shallots, and onions may now be planted out. Celery should still be earthed up, taking care not to have the beds too wet.

REMINDERS FOR JULY.

LIVE STOCK.

HORSES.—Those stabled and worked regularly should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley or linseed. Mares due to foal early if in poor condition should be fed liberally. Commence preparing stallion for season, especially if worked.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows unless in good condition should be fed liberally to stimulate milk flow. Calves should be kept in warm, dry shed. The bull may now run with the cows

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run.

SHEEP.—The classing of merino and all lamb-raising ewe flocks should be commenced; none but roomy thick ewes, carrying a bulky fleece, should be kept. Class rams; keep only the best in shape and fleece, castrate all others, and prevent them being used by those who think any ram good enough. Deep and narrow forequartered rams are responsible for many carcases dressing and freezing plainly, although often carrying a good fleece. Sell aged and barren fat ewes from breeding flocks. Clean filth from breech of ewes of British breeds now commencing to lamb. Wherever possible, send lambs weighing 60 lbs. live weight to market. Early prices are always best; avoid waiting until the rush of the season.

POULTRY.—Mating of birds intended for breeding purposes should receive immediate attention. Ten second-season Leghorns or Minorcas, or six of the heavier birds, such as Orpingtons, Plymouth Rocks, and Wyandottes (preferably in their second year), with a vigorous unrelated cockerel will be found satisfactory. Table birds bred in July and early August will pay handsomely prior to the Cup Carnival. A tonic in drinking water as a preventive against chicken pox and other ailments is advantageous.

CULTIVATION.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—Continue to plant deciduous fruit trees, bush fruits, and strawberries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, early Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching, and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Complete, as early as possible, the application of manures other than nitrates and sulphate of ammonia if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

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REVIEW OF THE VICTORIAN DAIRYING SEASON, 1913-14.

By P. J. Carroll, Senior Inspector of Dairy Products.

The season 1913-14 opened auspiciously. Seasonable autumn rains provided an abundance of grass, and all prospects pointed to a very successful export season. The surplus butter of new season's make available for shipment at the end of August amounted to nearly 300 tons, as compared with 200 tons for the previous season. Each successive week showed an increase of from 100 to 200 tons over the corresponding week of the previous year. This satisfactory condition of things continued until the end of December, when the total amount received in excess of the preceding year was close upon 2,000 tons. The absence of rain during December and succeeding months dried up the pastures, and this fact was soon reflected in the supplies coming forward for export, with the result that for the four months ending 30th April the amount received was 2,688 tons, compared with 3,986 tons for the corresponding period of the previous season, thus representing a falling off of nearly 1,300 tons for the four months.

The figures for the seasons 1913-14 and 1912-13 are as follow:—

1913-14	13,004 tons.
1912-13	12,586 ,,

Although a slight improvement is shown in the quantity of butter exported, viz., 418 tons, it is insignificant when compared with the export of 1910-11, when the total reached was 25,000 tons.

One reason that can be advanced in extenuation of the failure to make greater progress in the direction of increasing production is the absence or insufficiency of rain at the right time. Another is the very general neglect of dairy farmers to grow fodder and conserve surplus spring and summer herbage for winter use. Perhaps Australia is unique in respect of its liability to droughts. It is abundantly evident, however, that they come frequently, and fairly regularly, but, none the less, usually find us unprepared.

At the Conference last year I remarked upon the excellent conditions then prevailing for the preparation of the land, particularly for the growth of summer fodders, but experience has shown that little heed was paid to that suggestion. The production of butter shows a more marked falling off during the early winter months than is usually the case. About the month of February production fell so low that supplies had to be drawn from the northern States to meet the demands of our own consumers. I may, perhaps, be permitted to facetiously describe us as living in a State of extremes, for was not Victoria in the early part of the season sending forward large quantities of butter for export to other countries, and at the latter period importing in order to supply her own requirements? Such a condition of affairs does not do credit to the State or to its dairymen, but as the latter are the principal losers, they will doubtless eventually realize the importance of making some provision for their dairy cattle in anticipation of scarcity and drought.

INTER-STATE IMPORTS.

A new aspect of the industry in Victoria is presented to dairymen as a result of the conditions above referred to. Since the beginning of the present year, 1,732 tons of butter, valued at about £194,000, have been imported into this State. Most of this was required to meet the deficiency already referred to, and much of it, I regret to say, displaced on the counters of the grocers and in the homes of the consumers butters of local manufacture, which were, in comparison, less suitable for table use. It redounds to the credit of the factories in Queensland and New South Wales, who sent their butter to this market, that the quality generally was good, and, notwithstanding the disadvantages of distance, compared favorably with best Victorian makes.

VICTORIAN PRODUCTION.

For the week ending 8th May the total amount of butter, and butter ex cream of Victorian production received by rail in Melbourne was, approximately, 200 tons, or about 100 tons short of the requirements of the Melbourne market. Taking this latter figure as a basis, the huge loss through shortage of supplies is equivalent to about £11,200 sterling per week to the dairying industry of Victoria. Another and more serious phase of the situation is the fact that a very large proportion of our own make was, when compared with the imported butter, not of sufficiently good quality to commend it to consumers, and it was as a consequence placed in cool store, where much of it still remains. Should circumstances not permit of its disposal in Melbourne, it must eventually be shipped to London at the commencement of the next export season. What this means to the reputation of Victorian butter is obvious, and additional to the financial loss to dairymen themselves.

QUALITY OF VICTORIAN BUTTER.

For the season under review the average score of butter passed for export was 90.47 points, as compared with 90.79 points for the previous season, and 91.07 for season 1911-12.

The following are the percentages of the different qualities for seasons 1913-14 and 1912-13 respectively:—

	1913-14.	1912-13.
Superfine	8.94 %	13.58 %
1st grade	64.89 %	59.59 %
2nd „	23.20 %	24.33 %
3rd „	2.65 %	2.46 %
Pastry	0.32 %	0.04 %

On looking into the history of the industry for the past nine years it will be seen that the proportion of superfine butter manufactured has been gradually declining, and the proportion of second grade on the whole increasing. The following table shows the actual movement during that period:—

	Superfine.	Second Grade.
1905-6	36.90	6.08
1906-7	34.87	7.47
1907-8	34.45	12.72
1908-9	29.02	16.76
1909-10	25.95	19.28
1910-11	19.45	19.07
1911-12	16.74	22.78
1912-13	13.58	24.33
1913-14	8.94	23.20

Comment on this condition of affairs is needless; whether the Department, the factory managers, the dairymen, or the selling agents are responsible is immaterial. The position is a serious one for the butter industry of the State. Officers of the Department have been freely taken to task in previous years for pointing out the existence of this cancerous condition, which is not only sapping the vitality of the industry, but threatens to completely disorganize it. It is evident from recent happenings, however, that those who were strongest in their allegations as to the superiority of the quality of Victorian butter—which attitude necessarily compelled them to disparage the statements of the officers of the Department—have at last been forced to admit that we are falling behind our more wide-awake neighbours.

I cannot help feeling a real twinge of regret, when, after looking back to the time when Victoria was in the van of progressive improvement, in quality as well as expanding production, when the reputation of Victorian butter was not even second to New Zealand, and when Victoria was held up as a pattern for other countries to follow—I reflect upon the mediocre position we find ourselves in to-day, with, in addition to a declining output, a slow but gradual deterioration in quality.

What is the reason for this unfortunate state of affairs? I venture to say that to a lesser or greater extent this will be found in the pernicious practice in vogue of returning a uniform price for consignments made up of distinctly separate qualities of butter. Different reasons are advanced and various remedies suggested, but not one of those will be effective in bringing about an improvement in quality until all selling agents have the courage to sell each grade of a factory's output on its merits, and return prices that truthfully reflect the quality of that class. I know the tastes of consumers in Melbourne are fastidious enough to induce them to pay more for superfine butter than they will for second grade; or, to put it another way, to refuse to pay as much for the latter as the former. I am not prepared to believe that the people in London are any different, yet we have numerous illustrations of butter of low first and second grade qualities apparently realizing as much in London

as superfine butters, and second-grade butter being returned at a higher value than the first grade from the same factory, notwithstanding the fact that the former was graded second by the managers, packed under the brand used for second-grade quality, and in some instances paid for at a second-grade price.

This phase of the question has never been explained or even touched upon by any of the numerous representatives of Victorian dairying interests who have visited London during recent years, although it is one of vital importance to the trade.

It might not be out of place to suggest that a provision should be inserted in the proposed Compulsory Cream-grading Bill, making it an offence for selling agents to pay for any butter sent to them for disposal a price not in accordance with the prescribed variation provided for in the payment for differential qualities of cream under the proposed Act.

UNSALTED BUTTER.

The following percentages of salted and unsalted butters were exported during the past season as compared with season 1912-13:—

Season.	Salted.	Unsalted.
1913-14	58.62 %	41.38 %
1912-13	66.13 %	33.87 %

The proportion of unsalted for the past season has been greater than for the previous one. Up till 31st December last over 56 per cent. of the total exports was made up of unsalted butter. From that period onwards the proportion was in the vicinity of 30 per cent. From a study of prices as compared with salted it would appear that there is a limit to the demand in London for unsalted butter. The early shipments, in which the proportion of unsalted was greatest, failed, by several shillings a cwt., to realize as high prices as salted butters, but towards the end of the season, when a smaller percentage of unsalted was arriving on the market, prices turned in its favour to the extent of 6s. or 7s. per cwt.

Factory managers were apparently badly advised in respect to this matter, and it would be an advantage from a financial stand-point if more consideration were given to the question of the proportion of unsalted butter that can be absorbed without incurring loss through sending more than is required.

EXCESSIVE BORIC ACID.

Only two consignments, consisting of thirty-six boxes of butter, were held up under this heading, as compared with eight consignments, representing 411 boxes, for the previous season.

MOISTURE.

Twenty-five consignments, comprising 568 cases, and representing twenty-one different factories, were found to contain more than 16 per cent. moisture, as compared with thirty-eight infringements for the season before. The average moisture content of the whole of the samples analyzed during the season was 14.06 per cent., against 13.91 per cent. for the previous year. The average moisture of the samples from the different districts of the State comes out as follows:—

Gippsland	14.18 %
Western District	14.09 %
City	14.08 %
North and North-East	14.06 %

Samples from Tasmania and New South Wales shipped from Victoria showed an average moisture content of 13.78 per cent. and 12.96 per cent. respectively.

DEFICIENCY IN BUTTER FAT.

Two consignments, representing twenty-nine cases, were found deficient in fat, and one consignment of fifteen cases deficient in fat, and containing an excess of boric acid.

CANE SUGAR.

Two consignments were detained on account of containing cane sugar, a prohibited ingredient under the Commerce Act.

UNFIT FOR EXPORT.

Three consignments, consisting of thirty-three cases, were refused shipment on account of the quality being regarded as unfit for human consumption.

INCORRECTLY MARKED WRAPPERS.

Two consignments of 145 cases were detained on account of the quality being inferior to the description on the paper wrappers.

SHORT WEIGHTS.

Twenty-two consignments, representing 1,123 cases, were intercepted on account of the short weight of sample boxes. Of these, 1,087 were found correct on weighing, and released for shipment forthwith. The balance of the thirty-six cases, having been made up, were also permitted shipment. Last year's contraventions under this heading were twenty-three consignments, consisting of 1,046 cases, eighty-four of which were found to be short weight.

SHORT AND BARE WEIGHT.

Forty-two consignments were discovered to contain both short and bare weights. On weighing the whole of these consignments, 2,029 boxes were found to be correct. Of the remaining 605 cases, 202 were found to be short weight, and 403 bare weight.

In 1912-13 there were sixty-eight consignments intercepted, of which 530 cases were short weight, and 704 bare weight.

BARE WEIGHT.

Seventy-two consignments, consisting of 3,707 boxes, were found bare weight on examination, and not so marked as compared with seventy-six consignments representing 3,988 boxes for the season before.

The number of factories offending in regard to short and bare weights was sixty-eight, as compared with eighty-four for the previous year.

Under the heading of contraventions a satisfactory decrease is shown, which denotes that more care is now being taken in the manufacture of the butter.

GRADING AND GRADE-STAMPING.

In the early part of the export season the issue of grade certificates was confined to factories requesting to have their butter graded and grade marked. On 17th November an instruction was issued by the Customs Department to the effect that certificates were to be issued under Commerce Regulation 43 to all factories who applied to have their butter

graded, irrespective of whether they applied for grade marking or not. When such application was made, the cases were to be branded with the "Approved" stamp in conjunction with the certificate number. Previous to the issue of the above instruction the output of ninety-six factories was being graded and grade stamped at the request of manufacturers and exporters, and the percentage of the butter so treated represented over 42 per cent. of the whole. Subsequent to the above instruction 50 per cent. of the butter received for export was graded and grade stamped, 23 per cent. graded only and certificates issued for same, and 26 per cent. ungraded. For the whole season 46.86 per cent. of the butter received for export was graded and grade stamped, as compared with 47.65 for the season 1912-13.

QUALITY OF AUSTRALIAN BUTTER COMPARED WITH NEW ZEALAND.

The quality of Australian butter has lately been very much under discussion as the result of the publication of the views of certain delegates from Victoria and New South Wales co-operative concerns who recently paid a visit to New Zealand, with the object of seeking an explanation for the often wide difference between the London quotations for New Zealand and Australian butter. Whether the compilers of this report discriminated between the different States when arriving at its motions, I am not aware. I want to say, however, that the conclusions arrived at by the delegation are a gratuitous libel on Victoria as a butter-producing State, and a gross and unwarranted attack upon the ability of its managers and dairy experts. The object of their mission was, it appears, "to ascertain the reason for advantages enjoyed by New Zealand," and the following conclusion sums up the result of their inquiry:—

> "That the conditions for making good butter in New Zealand are more favorable than in Australia, and it is small wonder that the New Zealand butter stands in higher estimation on the London market than does Australian."

Now it appears to me that if this expresses the faith of those delegates in the future of the industry they represent, they are not going to help it very far on the road to fortune. It, therefore, behoves those of us who are not yet convinced of our helplessness to carry this examination a little further, and ask, what are those "more favorable conditions"? What difficulties has New Zealand overcome that we cannot? What exclusive advantages does she possess?

These delegates submit several reasons in support of their conclusions, of which the following are, as far as I could gather, the principal:—

(1) That with the exception of the Auckland province all of the butter in New Zealand is made from whole milk supply. Comparing the home separator supply of New Zealand with Australian, the latter is very much at a disadvantage.

(2) The pastures at the time of visit consisted of English grasses and clovers, and were as green as is usually the case in Australia in the middle of November. With conditions such as these are, it is not to be wondered at that there is very little second-grade butter made in New Zealand, even from home-separator supply.

(3) The temperature is not nearly so high in New Zealand as it is in Australia.

(4) Owing to the richness of the land, the supply is gathered from comparatively small areas.

(5) It is almost incredible that nearly the whole of the factories in New Zealand have for the past four or five years been successfully carrying on pasteurization, whilst in Australia few of our managers know how to do it, nor have we experts competent to instruct them.

Now, as it appears to me, these five reasons purport to show why New Zealand butter is better than Australian. One would imagine that such reasons would, if correct, completely vindicate the managers and experts from the charges of incompetency made against them, for are not four out of five of these alleged advantages beyond the control of the factory managers and dairy experts, some of them being the endowments of nature, which not even the members of the delegation are capable of altering or influencing? The fifth reason, however, viz., that relating to pasteurization, was the one upon which the delegates relied chiefly, and with that I will deal fully in its proper place.

The first reason, that relating to milk supply system in New Zealand as compared with cream supply in Victoria, is one that concerns the directors and those representing them, not the managers of butter factories or officers of the Department of Agriculture, although the latter have, in and out of season, strenuously fought the extension of the home separator systems in districts where the delivery of the whole milk to the factory or creamery was practicable. I have no recollection of any efforts on the part of representatives of co-operative selling associations to assist the Department in this fight. On the contrary, departmental officers have been bitterly attacked through the medium of the press and at public meetings by representatives of the dairymen for advocating and upholding what it then pleased them to describe as antiquated ideas. Indeed, it was only very recently that a member of this same delegation vigorously denounced an officer of the Department for stating, through the press, that where the system of milk supply was changed to cream supply, a noticeable falling off in quality became apparent. How are the mightly fallen! Nor is it so very long ago that a movement was initiated in the Western District by co-operative interests, which had for its ultimate object the abolition of the present milk supply in favour of the adoption of the home separator system. Fortunately, no action was taken by the factories directly interested, but what the acceptance of this scheme would have meant to the producers of the Western District is made fairly obvious in the report of the delegates.

No. 2. *Pastures as a Factor.*—My own experience—and, doubtless, yours, too—has been that when pastures are rich and luscious more care is required in the handling of the raw material, and that feedy flavours are more prevalent; and we have yet to learn that the experience of New Zealand dairymen is anywise different. As to the statement of the delegates that the condition of the pastures at the time of their visit in February were similar to those of Australia in November. Is not New Zealand a later country than Victoria in the same sense as Victoria is later than New South Wales, or Gippsland than the Northern District? Climatically, February in New Zealand is relatively the same as November in Victoria. The climate and pastures most undoubtedly vary there

in the same way as they do here. I have seen English grasses and clovers green in both Gippsland and Western District in the month of February. But if green and succulent grasses are the essential factors in the manufacture of superfine butter, how then do the delegates account for the superiority of butter made in Denmark, where the cows are artificially fed, and only allowed restricted access to pasturage?

No. 3. *Temperature in New Zealand more favorable.*—I think this reason is the most untenable of the lot. I need only invite your attention to the previous references in this paper, where I have described how butter from the northern States of Australia has displaced in our own market tons of butter made in the colder climate of Victoria. Butters from these States have been, and are being, accepted by the consumers in preference to many Victorian brands now being put on the market, chiefly on account of their finer quality. Further evidence of the ability of Australian butter-makers to successfully cope with warm temperatures is found in the prices realized in the London market for New South Wales butter. I have this average by me, and it is only a few pence per cwt. less than the Victorian average, whilst the quotations for best are always on a par with best Victorian.

In our own State the climate varies between north and south to a very considerable extent, yet many of you in this room will remember when Euroa stood for everything that was good in butter. Such factories as Milawa, Hansen, Benalla, Kilmore, Wilby, and even Warracknabeal, in the Wimmera, then held leading positions in the market, and rarely made butter that did not score superfine points at the cool stores. Surely this is sufficient to demonstrate that the manufacture of good butter is not necessarily controlled by climate. I am inclined to think that it is more a matter of the condition in which the raw product is delivered to the factory. It was with the advent and spread of the home separator in these districts, and not to any change in the temperature, that the quality of the butter deteriorated. The Milawa Butter Factory to-day is turning out butter of just as good quality as it did ten years ago, simply because it has preserved its milk supply system.

Now I come to the question of actual temperatures in New Zealand as compared with the western and southern districts of Victoria. For the purpose of this comparison, I am taking the principal months in which butter for export is manufactured in the districts of Victoria above referred to, and in New Zealand. The export season in Victoria ranges from September to January, both inclusive, and in New Zealand, from November to March inclusive. Now the average mean temperature in the Western District of Victoria during the above months is 58.6 degrees F.; Gippsland (North), 59.8 degrees F.; North Island of New Zealand, 61.6 degrees F.; and the South Island of New Zealand, 58.4 degrees F.

No. 4. *Supplies drawn from comparatively small areas.*—This is no doubt a great advantage from the point of view of cheapness and prompt delivery to the factory. Physical disabilities, however, due to scattered supplies and remoteness from factory can be overcome by thorough and effective organization. This has been fully demonstrated by the management of the Korumburra Butter Factory, where, I believe, I am safe in saying supplies are drawn from a greater distance and more extensive area than any other factory in Victoria.

This is all the more notable on account of the hilly nature of the country and the inaccessibility of most of the dairy farms. In the last report and balance-sheet of the above company, it is stated that 95 per cent. of the cream received was of superfine quality, and the reputation of the Korumburra butter leaves no room for doubt as to the possibilities of making a superfine butter in Victoria from home-supply cream.

No. 5. *Pasteurization in New Zealand.*—No one would question the fact that pasteurization, if applied to cream, suitable for such treatment, is an advantage. It removes feedy taints and flavours, and improves the keeping quality of the butter so treated. It also tends to greater uniformity in quality. This was fully proved in Victoria twenty years ago. Mr. W. H. Potts, now Principal of the Hawkesbury Agricultural College, when scientific instructor to the Department of Agriculture, visited many of the factories in the State, supervised the installation of pasteurizers, and gave instructions in the process of pasteurization and the preparation of pure cultures. In 1897, Mr. R. Crowe, then assistant dairy expert, gave results of experiments carried out in conjunction with a Mr. Olsen, a Swedish dairy expert; Mr. A. N. Pearson, Government analytical chemist; and the late Mr. David Wilson, Government dairy expert, and the conclusions arrived at by these competent authorities all pointed to the advantages to be gained by pasteurization. Later, experiments and demonstrations were carried out at the Kyneton, Grassmere, Farnham, Tungamah, and Koroit factories, and the resultant butter was examined by Mr. Clements, a well-known English butter merchant, who stated that the pasteurized butter was worth at least 8s. per cwt. more than the unpasteurized from the same factory. In some of the above factories pasteurization has been continuous ever since. There were then thirty pasteurizing plants in operation in Victoria. About 1902 I was present at the installation of seven pasteurizers in the creameries and factories of the Colac Dairy Company. At that time city firms were offering and paying a premium of 1d. per pound for all pasteurized butters. As recently as 1908 officers of this Department visited about a dozen factories in different parts of the State, and successfully demonstrated that pasteurization, where applied to suitable cream, made for an improvement in the quality. Instruction was imparted to factory managers and employés, and the Department went so far as to provide the plant for carrying out the demonstrations. So satisfied were many of the managers with the beneficial results obtained by pasteurization, that they recommended their boards of directors to purchase the plants. Reports are on record from Melbourne agents to the effect that the butter made from pasteurized cream was worth a 1d. per pound more than the same factory's output immediately prior to the adoption of pasteurization. These facts have surely escaped the notice of the members of Co-operative Selling Societies.

As to the ability of the dairy experts to impart instruction in pasteurization, I desire to point out that the grading officers of the Department have individually carried out pasteurization successfully when employed as managers of butter factories in the State prior to joining the Department, and were thoroughly familiar with this system many years before members of the delegation were introduced to the business of selling butter. With due respect to the numerous discoveries of this self-appointed Commission, I emphatically assert that, given the same

system of delivery as New Zealand, viz., milk supply, the quality of Victorian butter will equal, and possibly surpass, even that of New Zealand.

I am heartily in accord with the work done by the New Zealand Dairy Commissioner and his staff, and would commend it for adoption by our own State, but no facts have yet been adduced to show that the present system in Victoria is due to the incompetency of either the officers of the Department or the managers of butter factories.

Cheese.—325¼ tons of cheese were shipped to the United Kingdom this season, the first shipment taking place on 6th December by the s.s. *Paparoa*, consisting of 88 tons. Three successive shipments followed:—The s.s. *Waipara*, on the 23rd January, took 137¾ tons; the s.s. *Argyllshire*, 2nd February, 47½ tons; and the s.s. *Limerick*, which sailed on the 14th March, 58 tons.

Although the greater portion of the cheese was not specially made for export, the quality on the whole was uniformly good, with one or two exceptions. The prices and London reports on the various shipments were encouraging, and compared favorably with those ruling for cheese of New Zealand manufacture.

Method of Packing.—Comment was made by London firms on the style and method of packing, and it was reported that the package employed by Victorian shippers was lacking in neatness and appearance. This matter was brought under the notice of exporters prior to shipment, and comparisons were made with a few consignments packed under the New Zealand system. The contrast was so strikingly in favour of the latter that for the future it is to be hoped that shippers will adopt the improved package. The following interesting discussion on the foregoing review is reprinted from *The Terang Express* of the 2nd June, 1914:—

The following discussion took place on the paper on the above subject (published in last issue), read by Mr. P. J. Carroll at the annual Conference of the Butter Factory Managers' Association:—

Mr. S. C. Wilson (Leongatha): Mr. Carroll has stated that some buyers say that pasteurized butter is worth 8s. per cwt. more than unpasteurized. Can he say whether it will be worth while going to the cost of pasteurizing to realize only 1d. per lb. more?

Mr. Carroll: *I can't answer that question. There are managers in the room who have pasteurized, and they should be able to answer.*

Mr. W. L. Watson (Colac): I have done more pasteurizing than anybody else. I can't say from my own knowledge whether we are getting more than anybody else. I can say we are able to get for 99 per cent. of our output the highest rates going. Considering the amount of mixed cream we use, that is a satisfactory result. What may have been in the past, I don't think it exists at the present time.

Mr. Carroll: You can't get any higher than the top. I am quite prepared to go into the matter of pasteurization with anybody. There are certain difficulties which can be got over if taken in hand in the right spirit. It has always been a puzzle to me why people did not continue pasteurizing.

Mr. Watson: If I can assist any of them I shall be delighted to do so. I said three years ago that I could not understand why people would not go in for pasteurization, and I say so to-day. I am quite sure it will improve the quality of the butter. I have never made butter out of cream that was not suitable for pasteurization. I don't think pasteurization will make bad cream into good butter; but pasteurized cream will make better butter than unpasteurized. My estimate of the cost of pasteurizing, without taking into account capital cost, is .03d. Without pasteurization I am satisfied we could not turn out the quality of butter we do.

Mr. Carroll: Unless they get an increased price the practice of pasteurization will not become general.

Mr. Watson: They will get increased prices.

Mr. Carroll: You say you are not getting more for your pasteurized butter than other factories are getting for unpasteurized.

Mr. Watson: We are getting top prices for 99 per cent. Pasteurization is not going to cure all ills of factory butter. It does not do away with the necessity for cream grading or better handling of material. But it is one thing that will help in increasing the quality of the butter.

Mr. J. Proud (Camperdown): We get equally good prices for pasteurizing, but we want more. I can't quite agree with Mr. Watson as to .039d. being the cost. Pasteurizing always costs us more. Of course, we had some difficulties at Korumburra that Mr. Watson may not have had. Money was not hanging to it when you can get equal money results without the expenses of pasteurizing.

Mr. Watson: I am not taking into account capital cost. I find .039d. covers the cost of working. Heating and cooling, as far as we are concerned, is about the total cost.

Mr. J. Carroll (Upper Maffra): What is your percentage of cream as compared with milk?

Mr. Watson: We have a two-thirds cream supply and one-third milk.

Mr. J. Powell (Boisdale): What are the compensating advantages if there is a loss of butter fat?

Mr. Watson: Our butter milk losses are about .2 per cent. If it is said there is a greater loss in butter milk with pasteurization, I don't believe it.

Mr. B. Corr (Bairnsdale): Does the quality improve at all? Suppose second grade cream is pasteurized, is there a possibility of making it first grade?

Mr. Watson: Most decidedly there is. There is every prospect of improving the quality.

Mr. Corr: Has it any effect on the metallic flavour?

Mr. Watson: Metallic flavour in pasteurized butter seems to disappear. That has been the experience with our export butter, which has arrived without the metallic flavour. That is where we could receive considerable assistance from the Department. It seems a funny thing to say that butter improves with keeping. But it loses that fault. Whether it would improve to the same extent without pasteurizing I don't know.

Mr. Corr: The metallic flavour increases.

Mr. Watson: I have not had a report from London this season, except that the butter is first class.

Mr. Watson, in reply to Mr. P. J. Carroll, said: Our average export price was 118s. We shipped all unsalted butter.

Mr. Wilson: Will Mr. Carroll give some information as to metallic flavouring disappearing in the cool stores? Probably the metallic flavour might disappear in the same way as "feedy" flavours.

Mr. Carroll: I believe to some extent metallic flavours are not so pronounced after cool storage; but I attribute that to contraction in freezing. When thawed out I am inclined to think they would reappear. The discussion on pasteurization is very interesting. It revolves chiefly round the fact that pasteurization improves inferior cream. We don't want to tinker with inferior cream. We want good cream. The aim of the Department is to bring about a system of producing and delivering good raw material which the factory managers will be able to handle. Given the material, 100 per cent. of the butter would be superfine. When you make an article of superfine flavour, then we can experiment with pasteurization and improve the keeping quality, even if you can't improve the grade. Pasteurization may make a first-grade butter out of second-class cream; but what is required is assistance in the delivery of the raw material. The supply of the raw material is the crux of the question. This difficulty can be got over by organization, as in the case of the Korumburra Factory, which I referred to in my paper when dealing with the question of supply. I was astonished and disappointed to look back ten or fifteen years and see how the results then compared with those of to-day. We ought to move at once and take practical steps in bettering the system of delivery.

Mr. Watson: That is the root of the whole evil. If only some means could be evolved whereby the material would be delivered in proper condition, we should soon improve the quality. The main reason for deterioration in quality is the introduction of the home separator. The quality of the cream has been improving this season. We have been reorganizing the system of delivery. Improvement will come about as soon as the carriage system is on right lines. But that won't get over the main difficulty. What is wanted is some independent person to go on the farm and get them to take proper care of their cream. What

the industry wants, and the Department appears to oppose at present, is proper instruction for the farmer. If that can be brought about we will not have much trouble.

Mr. R. A. McKenzie (Poowong): In reference to salt and unsalted butter, we are told that salted butter is more liable to become "fishy" than unsalted.

Mr. Carroll: I believe that is correct. But the question whether the salt itself is responsible for the trouble, or whether it is due to an inherent quality in the butter before the salt is added, is one which should be investigated very thoroughly.

Mr. Wilmshurst (Bloomfield): Mr. Watson's remarks as to the necessity for an independent man to be sent to the farmers to teach them how to take proper care of cream seems to me to raise the whole question of instruction in the State, not only for farmers, but also for factory managers. We want a comprehensive system of instruction throughout the State, and it is a favorable time to urge our legislators and the Agricultural Department to consider the question of providing facilities for factory managers to improve their knowledge and increase their skill. The Department should also send individual instructors to the farms.

Mr. McKenzie: If we want to improve matters the Government ought to send instructors to the farmers to work in conjunction with the factory managers.

Mr. Dalton: I understand the Department has already dairy supervisors. Would not they impart instruction?

Mr. Carroll: Yes. That is what they are appointed for.

Mr. Christensen: *Re* dairy supervision in my district, there is a supervisor, but his visits to the farms are only made at about six-monthly intervals.

Mr. Carroll: With regard to Mr. Christensen's remarks, it is only fair to the Department, if there is any laxity on the part of the supervisors, to communicate that fact to the Department. I am sure that if the matter were reported, the Department would see that proper inspection was carried out. I believe a good deal could be done by way of inspection; but it is primarily a matter of factory organization. If you go round to the farmer and bring him close to the factory by sending for his cream, you will improve the quality of produce. If the company spends money in organizing delivery it will not be a tax on the producer. Inspection might go hand in hand with that. If the producer persists in doing wrong, then he should be punished in some way

Mr. Christensen: When the Dairy Supervision Act was first enforced, I understood the supervisors were to call on the factories.

Mr. Carroll: So they should.

Mr. Christensen: Our man has too much to do. With compulsory grading he will have more to do.

Mr. Carroll: Yes. I may say that the Cream Grading Bill has been drafted. I have seen the draft.

Mr. W. J. Wilson (Drouin): I think the whole position of quality goes back to cream grading. There is no use blaming the factory managers for the quality of the butter. Our managers can make good butter if they get good material. All the resolutions we pass and send on to the Department seem to be shelved. We would be in a much better position if some of our resolutions had been taken notice of. (Hear, hear!)

Mr. Wilmshurst: Will Mr. Carroll enlarge somewhat on his remarks as to prices returned by selling companies in regard to the different butters sold in London?

Mr. Carroll: The information we have obtained regarding prices has been given us in strict confidence. It would not be fair to disclose the prices of the different factories. What is the good of one factory improving the quality of the butter if another factory which makes inferior butter gets the same price? I have a factory in my mind which has made two grades—superfine and first; yet the difference in price returned is only 1s. 6d. and 2s. a cwt. If it costs that man more to produce superfine, as it undoubtedly does, he does not continue to make it. He mixes his grades together, and sells it as one quality. We have a chart here (pointing to the wall) covering the last twelve years, showing the range of movements of different factories during that period, each factory being represented by a number. There are some very creditable records, and some less creditable. It will be interesting to the factory managers to peruse it.

Mr. W. J. Wilson: Are you aware of any factories obtaining better prices for pasteurized butter than unpasteurized?

Mr. Carroll. There may be a few obtaining better prices.

Mr. S. C. Wilson: Our factory got so satisfactory a result from pasteurizing that we ordered a new pasteurizer. In the meantime prices for pasteurized butter got to the same level as unpasteurized. It cost us .1d. to .15d. to pasteurize. But as we got no benefit, what was the use of continuing? The pasteurizer, which cost a good deal, arrived, and has not been used. No doubt if it holds butter up one or two points it will be a good thing. Unpasteurized butter has the better flavour. Pasteurized takes some days to get the proper flavour. That is why we turned it down.

Mr. McKenzie: We find it improves lucerne cream.

Mr. Christensen: In one of our factories we were under the impression it improved second-quality cream. Then we could get no skim milk from anybody to make a starter.

Mr. Carroll: With regard to flavour, the cream might have been over-ripe at time of pasteurization.

Mr. S. C. Wilson: That may be so. It was ripe; but I don't know if it was over-ripe.

On the motion of Mr. Wilson, seconded by Mr. Watson, a vote of thanks to Mr. Carroll for his paper was carried by acclamation.

The following remarks are in reply to some statements made at the recent Conference of Factory Managers, by Mr. H. W. Osborne, of the Western District Co-operative Association, and Mr. A. W. Wilson, of the Gippsland and Northern Co-operative Selling Company:—

In dealing further with the comparisons already made between Victorian and New Zealand conditions, Mr. Carroll pointed out that New Zealand was just now on the fringe of the trouble that Victoria had been experiencing for years. The home separator was coming more into use, with its consequent ill effects. In the report of the New Zealand Dairy Commission, for the year 1913, Mr. Cuddie makes the following comment:—

> "The element of competition which exists in some districts between dairy companies (both co-operative and proprietary), and to which the cream-gathered system lends itself, has rendered it more difficult to maintain high grades. The keener this competition the poorer the produce, and dairy farmers would do well to discourage every such practice, for it strikes at the very root of success in co-operative dairying and the making of high-class butter."

It was very evident that before long the quality of New Zealand butter would feel the influence of the home separator to a very marked extent, unless, of course, they anticipated the trouble by organizing an effective system of cream collection, which would bring the raw material to the factory in a condition suitable for subsequent treatment, and which would enable them to make a first quality butter.

According to the report of the delegates who recently visited New Zealand, 27 per cent. of the supply was received from home separator sources. A comparison of the grades of New Zealand butter on the same basis as Victorian would indicate that New Zealand's proportion of butter scoring below 90 points was 20 per cent., as against 27 per cent. in Victoria, where 95 per cent. of the supply is home separator cream. It would, therefore, appear that New Zealand is not in any better position with regard to the making of first-grade butter from home separator supplies than is the case in Victoria.

Adverting to the statement attributed to me by Mr. Osborne in his address yesterday, "that all butters manufactured were sold for the one price," I did not mean to infer this. Every one knows that low second-grade butters are at a discount on the Melbourne market. The fact remains, however, that factories consistently manufacturing a superfine

butter do not get any more than a neighbouring factory, which makes a butter of more irregular quality, ranging from low first-grade butter to superfine, and with sometimes a portion of second grade. This fact is well known to managers here present, as well as to selling agents.

My references to pasteurization were also misrepresented by Mr. Osborne. I have looked in vain in my address for any reference to the fact that pasteurized butter did not realize a higher price than unpasteurized. This information was volunteered by a number of the managers present at the meeting, and was given as a reason why they discontinued pasteurization. I might with more justification make that charge against Mr. Osborne, for did he not state that pasteurization had improved the output of the Colac factory, and goes on to say that pasteurized butter does not realize more than butter manufactured under other conditions. It is admitted that the difficulties are greater in Australia than in New Zealand, owing to the almost universal use of the home separator, but the remedy does not lie in the scientific treatment of bad cream, but in the adoption of practical measures to get the cream to the factory in a fresh and sweet condition. No amount of scientific treatment will enable a buttermaker to turn out a prime butter from cream that has advanced even to the first stages of decomposition.

Mr. A. W. Wilson, manager of the Gippsland Northern Co-operative Selling Company, stated that the officers of the Victorian Department of Agriculture had not assisted the dairying industry in respect to pasteurization as the officers in New Zealand had, and if, as stated, they knew in the Victorian Department about the benefits of pasteurization twenty years ago, it did not reflect much credit on them that pasteurization was in such a backward state in Victoria. Mr. Wilson also referred in detail to the practice in New Zealand of examining every churn mark of the consignment, and where portions of that brand were found below the first grade, those boxes only were branded second grade, and not the whole consignment, as is done in Victoria.

Mr. Carroll, in reply, said that with regard to the question of pasteurization, he had already dealt with the Department's attitude, but would reiterate the statement that the officers were all qualified to give instruction in pasteurization and the making of pure cultures, and that they had in all cases, where an opportunity was offered, successfully demonstrated this fact; and further, that an improvement was made in the quality of the resultant butter, provided, of course, the cream was in a fit condition. This contention has been amply borne out by the managers in whose factories the demonstrations were carried out. The Department is at the moment prepared to despatch an officer to any factory requesting assistance of this nature, and will undertake to prove up to the hilt that they are qualified to carry out pasteurization. The description of New Zealand's methods of examination was interesting, in so far as it is a fac-simile of the practice in vogue in this State, and what is the more interesting is the fact that it is compulsory under the Commerce Regulations. Whilst it is true to a certain extent that certificates are issued to manufacturers on the lowest scoring churn mark, this method is unavoidable in the absence of grade branding. In the case of butter that is grade branded, however, every facility is given exporters, when two or more grades are found in one consignment, to separate the different grades, so that they may be branded with their respective grade brands, and certificates issued in accordance with the grades awarded.

When cases similar to the one stated occur, a written notification is sent by messenger to the agent representing the factory, intimating that certain churn marks have been found of a different grade to the bulk of the consignment, and containing information regarding each churn mark examined. Mr. Carroll here produced copies of four such communications, which had been sent to the company in question, and in only one instance was the privilege of separating the different grades availed of. Mr. Wilson was evidently unaware that such a provision existed, but the fact remains that even his own company was offered the concession that he claims is so beneficial in New Zealand, and failed, with a few exceptions, to take advantage of it. The practice in vogue here with butter that is not grade stamped, and in the case of grade-stamped butter which is not separated by the agents after notification is given, would no doubt tend to lower the average grade of Victorian butter, but any other method, in the absence of grade branding, would be misleading. In New Zealand the range covered by first grade, viz., 88 to 100, practically embraces the whole of the butter produced there, so that the work of separating grades would be comparatively light as compared with this State, where we have two distinctive grades in butters scoring over 90 points, and I feel sure the manufacturers of superfine grade of butter are not prepared or anxious to sacrifice their right to distinguish their product from first-grade butter. The fact must not be lost sight of that the primary object of grade stamping is to uplift the quality of the butter, and to encourage uniformity in the manufacture. The averaging up of the grade of butter by mathematical means would be as absurd as it would be improper, and would defeat the object aimed at in grading and grade branding. In New Zealand the butter is sold on the points, so that it is not material that the stamp does not discriminate between the higher and lower qualities in the first grade. Encouragement to excel in the manufacture of good butter should be the prime motive of every person engaged in the industry, and I am surprised to hear even a suggestion that the existence of a superfine class should be abandoned.

POTATO DISEASES—THE DANGER OF IMPORTATION.

By C. C. Brittlebank, Vegetable Pathologist.

Since the publication of Mr. McAlpine's *Potato Diseases of Australia*, 1911, Victoria has, so far, been fortunate in not having to record any of the more serious diseases affecting potatoes in Europe and other countries. The only new disease, and one possibly of minor importance, is that commonly known as "Scurf" or "Dry Scab" (*Spondylocladium atro-virens*, Harz). This was first recorded from a shipment of potatoes grown in another part of Australasia. It has, however, been observed upon Victorian-grown potatoes, and in all probability this disease will, like the poor, be always with us.

That a disease which is, fortunately perhaps, one of the less-dreaded should have become established in our potato lands during the past three years shows how careful the inspection should be of all oversea shipments. Even with the keenest and most careful inspection, especially when the shipment is large, there is great danger of introducing disease, which may, at the time of inspection, be so slightly developed that detection would not be possible. The soil clinging to the tubers might be a source of danger.

The "Dry Scab," though generally looked upon as a skin disease, and one not likely to cause considerable loss to the grower, should be guarded against by the rejection of all affected seed and the strict rotation of crops. Potatoes affected with "Dry Scab" can be detected by the scurf or flaked skin, and by the irregular purplish markings or patches on the skin, which are occasionally slightly depressed. On close observation minute black dots can be seen on the surface of the affected parts, and also in the loose flaky skin which breaks away. In severe cases the flesh of the tuber is affected by the fungus and rendered of less market value.

There are two serious potato diseases which have not at present been observed in our potatoes, viz., Corky or Powdery Scab *Spongospora subterranea* (Wallr.), Johnson and Black Wart Disease *Synchytrium endobioticum*, Percival. The former has, however, been detected in two separate shipments of potatoes from Europe, which were, fortunately, examined with the greatest care. Both consignments were seized and destroyed. The disease has been known for the past sixty years, when it was named *Erysibe subterranea* (Wallr.). At a later date the name was altered, and the fungus was placed among the Smuts from the superficial resemblance of the spore-balls to those of Sorosporium.

To give some idea how prevalent the disease must be in European countries and Great Britain, an extract from *Bulletin* 82.U.S., Department of Agriculture, "Powdery Scab" (*Spongospora subterranea*) of potatoes, by J. E. Malhns, Pathologist, 6th April, 1914, is given below:—"In the spring of the current year the United States Department of Agriculture imported eighteen different varieties from Scotland for seed purposes, all of which were found to be infected with Spongospora, and were condemned by the inspecting pathologist. Nine different varieties were imported from England for similar purposes, and were not allowed to pass owing to Spongospora infection.

On 31st October, 1913, Mr. W. W. Gilbert, of the Bureau of Plant Industry, collected specimens of powdery scab on potatoes imported into this country from the Netherlands. The following day specimens were taken by Mr. D. A. Pratt and the writer from a shipment coming from Belgium. More recently the disease has been found several times in considerable quantity on potatoes coming from the Netherlands and Belgium."

Notwithstanding the strict inspection of all potatoes entering the ports of the United States of America, this disease has lately become established in the potato lands of that country.

Prof. T. Johnson gives a complete account of this disease in the Econ. Proc. Dublin Royal Society, Vol. 1, Part II., 1908. Expressing his astonishment at the prevalence of the disease in the West of Ireland, he writes:—"I was astonished, in the course of my visit, to find Spongospora scab everywhere. Roughly speaking, every plot of potatoes that I visited showed the scab." To allow the importation of potatoes from any country infested with Spongospora scab into a country free from that disease is simply courting disaster.

The Black Wart Disease *Synchytrium endobioticum* (Schelb.), Percival, which is probably the worst disease affecting potatoes, has not been detected in any shipment forwarded to this State. If the disease observed in Hungary by Schilbersky was the Black Wart, then it has been known for a period of eighteen years. During this period it has spread considerably in Europe, and also to England, Scotland, Ireland, Newfoundland, and America, and there is the ever-present danger that it may be introduced here. Although we have strict quarantine regulations in regard to the importation of potatoes, which have, for a period of two years, to be grown under the supervision of an officer and upon an area set aside for that purpose; even with the strictest quarantine regulations there is danger of introducing the Black Wart Disease, to the great and lasting loss of our potato-growers.

The Black Wart was recorded for the first time in Scotland by Dr. J. H. Wilson, of St. Andrew's University, in 1901, and also in England during that year. In a report issued by P. Edward Foukes, Principal of the Harper Adams Agricultural College, Newport, Salop, England, on the wart disease of potatoes, November, 1910, there is a map of the United Kingdom, showing the distribution of the disease at the time of publication. Practically the South and South-West of Scotland and the whole West Coast of England and Wales, and several Midland Counties, extending east to Nottinghamshire and south to Warwickshire, are affected. Granting that the disease was established in the potato land in 1901, when it was first brought under the notice of scientific workers, the subsequent spread of the disease must have been rapid, to embrace so large an area within the period of nine years.

The fungus is known to remain in an active state in the soil for eight years after an affected potato crop has been lifted, and, consequently, potatoes should not be planted again until the lapse of a longer period. Our potato-growers can best estimate the loss which such a course would entail. The Black Wart is more virulent in some countries than in others, heavy rainfall favoring its development.

From the serious nature of these diseases it would be as well, before too late, to totally and absolutely prohibit the importation of potatoes

into Victoria from countries beyond the Commonwealth. Varieties suitable to the climate could be raised within the State, either from seed imported from abroad or raised here. By adopting this course the danger of introducing either of the above diseases would be minimized. In the early history of wheat-growing in this State many failures were recorded, owing partly to unsuitable varieties, and it was not until the late Mr. W. Farrer, wheat experimentalist to the New South Wales Department of Agriculture, led the way by producing wheat suitable to the Australian climate that any marked improvement took place. If this can be done for one kind of farm product, why not for another, especially when a great danger threatens a portion of the farming community.

Spongospora subterranea (Wallr.), Johnson and *Synchytrium endobioticum* (Schilb.) Percival, have not as yet been observed in Victoria, nor, so far as I am aware, in any of the Australian States. It will possibly come as a surprise to the Plant Pathologists of Australia to learn that America has forbidden the importation of potatoes grown in Australia on account of the presence of Black Scab (*S. endobioticum*) (Schelb.) Percival. That Australia should be placed in line with the infested countries certainly comes as a surprise, and it would be interesting to obtain the authority for its inclusion.

Dr. Melville Thurston Cook, in his *Diseases of Tropical Plants*, 1913, page 212, states that Black Scab is found in Australia as follows:—"Black Scab.—This disease is known in Australia, and is due to the fungus *Oedomyces leproides* (Trub.). The young shoots become brown and wrinkled; the tubers wrinkled and warty. The organism lives in the soil, and is thought to gain entrance through the eyes." Dr. Melville Thurston Cooke, when requested by this branch to give the authority, stated that he could not find any reference in his own or the library of his university, but thought the reference might possibly have been obtained from some of the larger libraries in the States. Further, he writes:—"It is possible that this reference was in some semi-scientific journal, and written by some one who was not familiar with the disease or confused two diseases."

The Union of South Africa has also taken steps to guard against the introduction of the Black Wart disease into that country. T. B. Pole Evans, M.A., Plant Pathologist and Mycologist to the Union of South Africa, Department of Agriculture, in his Annual Report, 1912-13, page 177, writes:—"The regulations designed to safeguard the Union against the introduction of Black Scab or Wart Disease (*Synchytrium endobioticum*) (Schilb.) Per., have been rigidly enforced, and so far as I am aware the Union is still free of this pest. The United States have recently followed our example in adopting legislative measures to prevent the introduction of Wart Disease, but not until it had already been reported from America. The Americans have, however, gone a step further than we have, in that they have entirely prohibited the introduction of all potatoes from Newfoundland, St. Pierre, Miquelon, England, Scotland, and Ireland, Germany, and Australia, on account of the Wart Disease." I am not acquainted with any quarantine regulations of the United States of America prohibiting the importation of potatoes from Australia into that country. I have before me the latest regulations issued on 22nd December, 1913. The prohibited countries are United Kingdom, Continental Europe, Canada, Newfoundland, St. Pierre, and

Miquelon. This is the same list, with the exception of Australia, as given by I. B. Pole Evans. Possibly a typographical error has crept in, making *Austria Australia*, as the *former joins the country from* which we have the first record of this disease.

During the past three years I have examined consignments of imported potatoes from various countries, and must express my surprise at the universally diseased condition of the tubers. Not a single lot has come to hand which was absolutely free from disease. Several diseases were usually present in each and every consignment. As an example, I give the diseases obtained in one shipment:—*Spongospora subterranea* (Wallr.) Johnson, *Phytophthora infestans* De Bry, *Rhizoctonia solani* Kuehn, *Spondylocladium atro-virens* Harz, *Fusarium oxysporum* Schlecht, *Oospora scabies* Thax, and *Bacillus solanacearum* E. F. Smith. As this is about the average number of diseases observed in any large consignment of tubers, steps should be taken to prohibit the importation of oversea potatoes into this State.

NITRATE OF SODA APPLIED TO BLOSSOMS.

Spraying with nitrate of soda—applying fertiliser to the blossoms—is the latest innovation in Californian horticulture, and, according to the reports of farmers and experts, the success has been phenomenal.

Recent experiments in the Pajara Valley with apple trees has produced wonderful results.

One instance (says a local paper) was on the orchard of O. D. Stoesser. In an impoverished orchard seven trees in the centre were sprayed, the others left unsprayed.

When fruit time came, the seven sprayed trees were heavily laden, while all the other trees in the orchard were almost barren.

Telling of having visited the orchard on a trip of inspection with several experts, a resident of Watsonville said—

"The crop on the Bellflower trees in the orchard was extremely light. Down near the middle seven trees in one row were pointed out, every one loaded to breaking, and every one having beautiful fruit.

We were given most solemn assurance that these trees were treated exactly alike all round, with the exception that a solution of nitrate of soda, 1 lb. to the gallon, had been sprayed on the tops.

There was one other tree in an adjoining row around which the same amount of nitrate of soda was worked into the soil as was put on the tops of the seven. This one tree showed a slightly heavier crop than others untreated, but nothing like each one of the seven."

Extract from "Fertilisers."

28th March, 1914.

It would be advisable to experiment with a few trees to see the effect before adopting this method of spraying to the general orchard.

BEE-KEEPING IN VICTORIA.

(Continued from page 370.)

By F. R. Beuhne, Bee Expert.

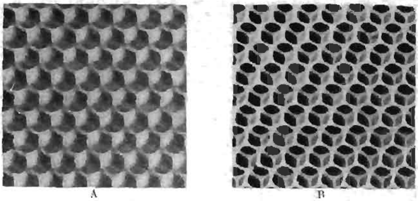
XXV.—COMB-FOUNDATION.

Comb-foundation consists of a thin sheet of bees-wax, impressed on both sides with the bases of the smaller or worker cells of honeycomb. It is given to the bees in the modern hive, suspended from the top bars of the frames, kept straight by means of fine wires embedded in the sheets, and is used by the bees as the midrib of, or the foundation upon which they build, the comb.

The advantages of using full sheets of foundation in the frames instead of allowing the bees to build comb in their own way are dealt with in another chapter. As comb-foundation is expensive, the very best use should be made of it, and this object is only achieved when the resulting combs are perfectly even and straight in the base, which, in turn, is only possible if the foundation is properly manufactured.

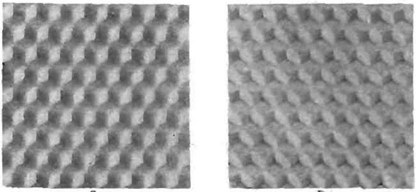
The comb-foundation sold by supply dealers is of the required standard of quality (Fig. 1, E.F.G.H.); but while the price is 2s. 3d. per pound, with 2s. per pound for large quantities, the apiarist only obtains, after allowing for freight and other charges, 1s. to 1s. 3d. per pound for the grade of wax usually made into foundation. In consequence many apiarists have purchased foundation rollers, and make their own foundation. It is, however, questionable, in some instances, at any rate, whether home-made foundation is not as expensive, and less satisfactory as to sagging and buckling, than that purchased from dealers, owing to the extra weight of the sheets and the imperfect embossing.

To turn out sheets, which, without making them too heavy, will be drawn out by the bees into nearly perfect combs, requires some skill, the proper appliances, and a knowledge of the properties of bees-wax under different temperatures during the process of manufacture. Most of the foundation made by beekeepers is either too heavy or imperfectly impressed, or it may be both. For brood or extracting combs, foundation, eight sheets to a pound, if well made (Fig. 1, A.B.) is quite heavy enough. Many beekeepers, being unable to obtain good combs from medium weight foundation, owing to the sheets being too faintly impressed (Fig. 1, C.D.) make them as heavy as five and a half to six sheets to a pound. This, to some extent, does away with sagging and buckling, but it raises the cost by about 1d. per sheet by unnecessarily using an extra amount of wax. If the rollers of the foundation mill are set close enough to completely fill the interstices between the cell cones of the rollers, while the cell bottoms of the foundation are quite thin and transparent, one pound weight will contain seven and a half to eight sheets Langstroth size. The extra wax in heavier sheets is in the cell bottoms, and adds but little to the freedom from stretching or buckling. To make good foundation, it is necessary to have the proper appliances and to keep the correct temperatures in the process of making the plain sheets as well as in passing them through the rollers.



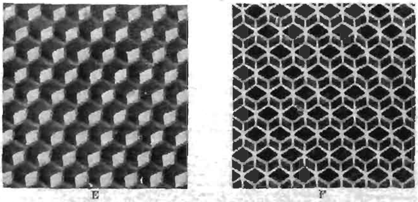
A B

A. Surface view
B. Looked *through* } Well made round cell foundation.



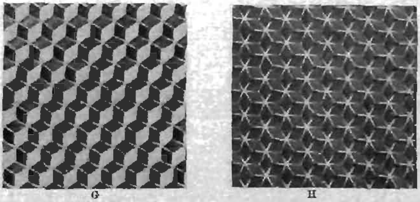
C D

C. Surface view
D. Looked through } Too faintly impressed.



E F

E. Surface view
F. Looked through } Weed process. Brood foundation.



G H

G. Surface view
H. Looked through } Weed process. Thin section foundation.

Fig. 1.—Comb Foundation.

TEXTURE, EXPANSION AND CONTRACTION OF BEES-WAX.

If the wax used for foundation is absolutely pure and clean the shade of colour is immaterial if the foundation is intended for brood or extracting combs. For sections, if possible, only the palest white wax should be used. How to obtain bees-wax of the greatest purity and best colour from old combs was described in chapter XVIII (*Journal of Agriculture*, November, 1913, page 654). To guard against infection of the colonies wax of unknown origin or from apiaries in which foul-brood exists, particularly when the solar wax extractor was used to obtain it, should always be first boiled with water, allowed to set and the blocks scraped clean before being re-melted for foundation.

To produce the best grade of foundation with a minimum of labour it is necessary to know the properties of wax at different temperatures. Wax is crystalline in texture, and comparatively brittle at ordinary temperatures. When kneaded its structure is altered, and it becomes and remains for a considerable time more or less pliable. Thus a thin sheet of wax, at a temperature of 60 degrees Fahr. is exceedingly brittle, but after being passed through the foundation mill at a temperature of 100 degrees it will be tough and pliable at 60 degrees, more or less, according to the degree of kneading it received from the rollers. The greater the pressure exercised the tougher will be the foundation. In the case of what is known as the weed process of manufacture the wax is subjected to a pressure of several hundred pounds to the square inch, the wax becomes semi-transparent, and the foundation tough, a circumstance which has given rise to the erroneous suspicion that adulterants have been added.

At a temperature from 120 degrees upwards wax becomes friable, and the sheets stretch and tear in handling. At about 150 degrees wax becomes a liquid, and expands more and more as the temperature rises. The greatest expansion of volume takes place between 180 degrees and 212 degrees, which, latter, is the highest temperature wax heated on water can reach. In cooling wax does not contract in the way it expanded, the expansion reached at the high temperatures is retained nearly down to the point of solidifying; thus wax heated to 200 degrees will contract considerably more on becoming solid than that which never reached more than 170 degrees; hence, wax to be cast in moulds for blocks should be heated to the boiling point of water so that it will easily leave the moulds, while, when intended for foundation, it should not reach more than 175 degrees in the final melting before dipping, otherwise the violent contraction of the sheets when immersing the dipped boards in water will cause cracking and splitting.

MAKING THE PLAIN SHEETS.

The first operation in the manufacture of comb-foundation is the production of the plain sheets of wax. It consists in the dipping of pine boards of given dimensions, and previously soaked in water, into liquid wax, cooling them in tepid water, peeling the sheets off the boards and trimming them ready for the foundation mill. The appliances shown in the illustration and described hereunder, as well as the method advocated, vary to some extent from those generally given in

textbooks, but have been found by the writer, after years of experience and experiments in the manufacture to be the best for the production of first class foundation at a minimum of cost in time and wax. The appliances used may be different in shape, and the working method may be varied to suit the person and the articles available, but the essential features of the appliances and of the method should be retained if perfect workmanship is desired in the finished foundation. The dipping boards should be of the best soft fine-grained pine wood. American shelving, free from knots, will be found the most suitable timber. The boards should be 17 inches long by 9 inches wide and $\frac{3}{8}$-inch to $\frac{1}{2}$-inch thick, planed smooth on both sides. The edges are best left straight and square, as then the sheets are easier to peel off than when the board is tapered or feather-edged. A wire handle (Fig. 2), made of steel wire, such as is found in bicycle tyres, is fastened into the ends of the boards. This will enable the boards to be completely immersed, turned end for end, without getting wax on to the fingers, and hung up on the revolving holder, shown in the centre of the illustration (Fig. 3), or on a rack of hooks placed in a convenient position.

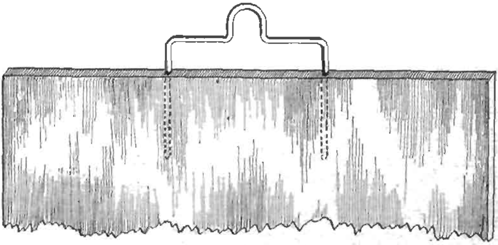


Fig. 2.—Dipping-board (end with wire handle).

The boards are first soaked in hot water of a temperature higher than that of the wax to be dipped, otherwise air bubbles, escaping from the boards during immersion in the wax, will blister the sheets. The quickest way of bringing the boards to the proper condition is to stack them with thin strips of wood between and a weight on top to keep them down in water in a tub or a vessel, as shown in the centre of the illustration (Fig. 3). When the water has been brought to the boiling point by means of a stove, the latter is turned down somewhat, and sufficient cold water poured into the vessel to reduce the temperature to 120 degrees, at which it should be kept. To prevent contact with the bottom of the vessel two narrow pieces of wood should be put under the lowest board. These strips and the fine sticks placed between the boards should be soaked in water beforehand, so that no dry spots, to which the wax would adhere, may remain. When the wax is ready in the dipping tank, the boards are taken out of the water one after another as required, and hung up to drain off surplus water so that they are just evenly damp all over. Before plunging it into the hot wax each board

is given a shake and turned end for end so that the drier end will enter the wax first. The board is pushed right under, except the top of the handle, quickly withdrawn, held perpendicularly over the dipping tank to drain for a few seconds, then turned end for end again, immersed in the wax, drained, for a moment plunged into water, and then hung up. The next board is then dipped, and so on, the stand being moved round from left to right, one board every time. When the first dipped board comes round to the operator on the left, the sheets have sufficiently set and contracted to peel off easily. The strips are pulled off the edges and ends, the boards rinsed in the soaking water of 120 degrees and hung up to drain. *As each board reaches the operator on the right, it is just of the right temperature and dampness for dipping. The dipped boards are immersed in the dish behind the dipping tank, which is only in part visible in the illustration. The water should be from 90 to 100 degrees; if colder the boards cannot be stripped quickly; if too hot the sheets take too long to set. For two-handed working, as in the illus*tration, ten boards are required; for single-handed five. In the latter case the boards are all dipped first and then stripped.

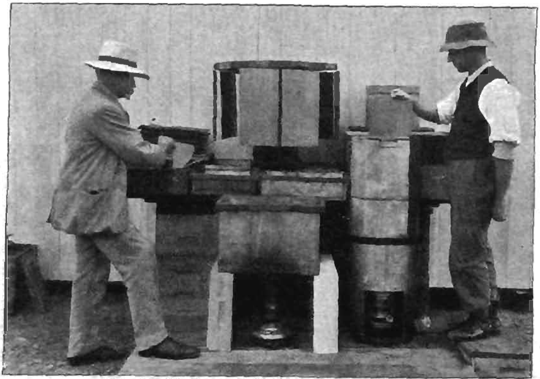


Fig. 3.—Dipping and Peeling off Plain Sheets.

The reversing of the boards produces sheets of more uniform thickness than when dipping several times from the same end. Even when reversing one end is smoother and somewhat thinner, and rolling should be from this end. When peeling off, the sheets should be placed on a board, evenly on top of one another with all the thin ends one way. When about thirty sheets have accumulated, and while the sheets are still warm, a straight-edge is put across the pack, and about ½-inch cut off at the thin end with a knife or a disk cutter. This trimming of the ends greatly assists in getting a quick start when rolling.

As already mentioned, the wax should be pure and clean. The most convenient way is to melt it in two vessels, placed inside a larger one

containing water. This will greatly reduce the risk of over-heating, and entirely do away with that of boiling over, while insuring a continuous supply. The temperature of the wax should never exceed by much that required for dipping, for reasons previously explained. A special tank, such as the soaking tank shown in the illustration, or a wash tub sufficiently large to hold two 60-lb. honey tins, the top of which have been cut out, may be used. A slow fire or a stove under it will supply the heat.

The dipping tank is a vessel oval in horizontal section, 12 inches wide one way and 3 to 4 inches the other, and about 21 inches in height. It is contained inside a similar tank of somewhat larger dimensions with hot water in the space between. The water is kept at a uniform temperature by means of a blue-flame stove, or other lamp contained in the stand, which supports the double tank, as shown in the illustration (*Fig. 3*). To obtain sheets of uniform thickness and correct weight, with a smooth surface, free from cracks or blotches, an even temperature of the wax during dipping, and after replenishing the tank is essential. This is accomplished by means of a thermometer, with the bulb in the hot water, and the turning up or down of the flame of the stove. When the dipping tank is first filled with liquid wax from the melting vessels it will take some little time before the temperatures of wax in the inner and water in the outer tank are the same. After that there will be but little fluctuation, unless the wax in the melting vessels from which the dipping tank is replenished is allowed to become too hot. When the supply of wax is exhausted what remains in the dipping tank may be worked out down to a few pounds by adding water of the same temperature as the wax whenever the level of the wax has to be raised to cover the dipping board.

When dipping for foundation seven Langstroth sheets (16¾ inches x 8 inches) to a pound, the temperature indicated by the thermometer should be 155 to 160 degrees, for eight sheets to a pound 165 to 168 degrees, and for section foundation 170 to 174 degrees, and the number of plain sheets in a 5-lb. pack, before trimming, about 28, 33 and 38 respectively.

(*To be continued.*)

SEEDING OPERATIONS AT THE GOVERNMENT FARMS, 1914.

1.—CENTRAL RESEARCH FARM, WERRIBEE.

H. C. Wilson, Farm Manager.

Since rainfall and weather conditions play such an important part in the success or otherwise of seeding, a perusal of the records gathered up to the date of this report should be of interest.

TABLE I.—WERRIBEE RAINFALL RECORDS.

Yearly and Monthly Averages.

Period.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average.
Past 42 Years—1872–1914	1·27	1·35	1·78	2·11	1·82	1·80	1·48	1·51	1·85	1·08	1·91	1·33	20·19
1913	·36	·64	5·05	1·11	1·35	·82	·70	1·38	1·64	1·08	1·46	·81	16·45
1914 to 15/6 ..	·89	·11	·94	1·50	1·45	·02	..	..	..	..	..	..	..

SEEDING 1914.

In comparison with the records of Table No. 1 it is noticed that the total for the year 1913 (16.45 inches) is 3.74 inches below the averages of the district for the past forty-two years. This deficiency is noticed more pointedly by the fact of the scanty rains which fell during the growing period of last year's crop, *i.e.*, 1st May to 31st October, 6.9 inches. The bulk of the rains of 1913 fell unseasonably, 5.05 inches being recorded in March before any of the earliest crops were sown. The winter and spring season of 1913 had a very detrimental influence on the fallowing operations practised last year in preparation for the present season. The soil turned over with the plows was in a very lumpy and rough condition, and was never sufficiently saturated to allow the cultivators to do their work in the preparation of a perfect tilth and seed bed for the crops sown during this season. Furthermore, a difficulty was experienced during the summer months in plowing stubble lands in preparation for catch crops and limited areas of barley, owing to the very dry nature of the soil during the months of January, February, and March of this year.

DRILLING OPERATIONS.

Sowing of the fodder crops was commenced during the first week in April. The seed bed was altogether too dry for germination. The rains that had fallen in the first three months of the year were very scanty and light, and were insufficient to saturate the dry fallows, and, therefore, a chance was taken, and a possibility of a poor germination likely. Seeding of oats and wheat for hay and grain was started on 27th April. Dry weather continued as the seeding progressed, and towards the finish of operations a very beneficial rain was recorded of 75 points on 26th-28th May. This seasonable rain put quite a different aspect on the probable results, and, although not heavy enough to saturate the soil, it insured the germination of the crops sown up to that date.

At the date of this report (12/6/1914) the crops sown before this rain, 26th-28th May, are all above ground, but have suffered somewhat from malting, and, in consequence, are thinner than they should have been had the rain favoured us earlier in the seeding season.

SOME PRACTICAL OBSERVATIONS ON THIS SEEDING SEASON.

Seed Bed.—During the greater part of the seeding season the seed bed was exceptionally dry. Fallows had to be worked constantly throughout the summer months to procure the necessary fine tilth after the rough ploughing during the dry fallowing season of last year. This constant working had the effect of drying out the surface layer of soil to a depth of 3 inches, and the seed bed, in consequence, was much too dry for efficient germination. A great proportion of the seed sown lay on the ground for over a month before germinating, and then, when germination took place, the plants were very thin and spindly in patches.

Malting.—I am pleased to be able to report that far less damage by malting was experienced than might have been expected under the conditions that prevailed. This, no doubt, was due in a measure to the fact that most of the earlier seeded crops were sown in soil that was far too dry to start germination, and growth started in these cases evenly after the rain of 75 points that was recorded during the last week in May.

Encrustation of Soil Surface.—This condition peculiar to the soils of the district is, no doubt, due to the deficiency of humus which is so marked after the continuous cropping systems that have been practised for the past thirty years on the fields of the farm prior to its possession by the Department. A surface crust forms (as a result of light showers), which is almost inpenetrable by the blades of the germinating plants, and if dry weather is experienced after the crust has formed, and before the plants show above ground, their chance of breaking the surface is small, and, as a result losses, which are sometimes put down to defective germination, are experienced. A very light harrowing, if it is possible, would be advantageous, but in actual practice the condition of incrustation occurs, and does damage so quickly that it is hard to properly and efficiently combat it. This incrustation not only does damage to the germinating crop, but its detrimental influence is noticed (if the crop has come through the surface of the soil before the crust has formed) until harrowing of the growing crop is practised, which seems, under certain conditions, to be a very important cultural operation throughout the district.

Possibilities of Weedy Crops.—Owing to the dry opening season of this year, following on the dry season of 1913, very few weed seeds germinated before seeding operations started, therefore the land could not be thoroughly cleaned with the cultivator prior to sowing. It is very likely that the crops which were sown early will be troubled greatly with the weeds that have germinated since the seeding.

With the object of the destruction of weeds in view, the seeding of the main hay and grain crops was postponed with the hope of rain falling until the latest convenient date. This late seeding was advisable under the conditions which prevailed, and light harrowings of the growing crop will be necessary in the course of a few weeks, with the double object in view of weed destruction and soil surface renovation.

Summary of Cropping Operations, 1914.

Field.	Soil.	Preparation.	Weather.	Seed Bed.	Crop.	Date Sown.	Rate of Seeding and Manuring.	Germination.	Prospects, &c.
					A.—Forage Crops.				
1. Railway paddock, 110 acres	Chocolate, clay loam; *very* dry	Summer ploughed, harrowed, cultivated, and drilled	Very dry ..	*Dry and* fine. Clean *of* weeds	Pease for sheep feed and soil *renovation*. Tasmanian blue, *14 acres, Early* Dun, 66 acres	April 1st to 10th	Pease 1½ bush. per acre Thomas' Phosphate 1 cwt. ..	Very slow *and* irregular	At present show signs of fair returns. Pea fallow catch crop to be fed off in *late September* and October
2. No. 9 S.E., 18 acres	Light-coloured loam	Double disced after maize crop	Dry ..	Previously *irrigated*. Good *condition*	Rape for sheep ..	May *4th and* 5th	*Broad Essex* 6 lbs. .. Mustard ½ lb. .. *Thomas'* Phosphate 1½ cwt. .. Blood Manure ¾ *cwt.* ..	Irregular and slow	Crop has thickened up, and, if season favorable, should produce a very good picking for the sheep
3. 7 and 8 S.E., 20 acres	Light loam, poor quality, Good condition	*Ploughed*, rolled, cultivated, and drilled	Dry ..	Irrigated during summer months. Good condition	Barley, Beerseem, Red Clover. *To* be fed off by dairy herd	Beerseem, *Feb.* 23rd; Barley, *Mar. 14th.* May 7th; Red Clover, May 12th. Five acres of each of above	Beerseem 15 lbs. .. Super 1 cwt. .. Barley 1¾ bush. .. Super 1½ cwt. .. Red Clover 20 lbs. .. *Super* 1½ cwt. ..	*Beerseem* very bad; Barley very good; Red Clover very good	*Should produce* heavy returns
					B.—Ensilage Crops.				
4. 3 and 4 N.E., 18 acres	Light loam; very dry	Summer ploughed, thoroughly cultivated, drilled, and harrowed	Very dry ..	Fine and dry	Pease and wheat *mixed*	April 14th and 16th	Wheat *60 lbs.* .. Pease 40 lbs. .. Super *150 lbs.* ..	*Very slow* and *patchy*	Since the recent seasonable rain *of* May 26th to 28th, this crop *has come* along wonderfully and promises fair yields

Summary of Cropping Operations. 1914—*continued.*

Field.	Soil.	Preparation.	Weather.	Seed Bed.	Crop.	Date Sown.	Rate of Seeding and Manuring.	Germination.	Prospects, &c.
				C.—Hay Crops.					
5. 10, 11, 12, S.E., 80 acres	Light loam	10, 11, fallowed and worked; 12, ploughed in March	Fine and dry	Open and dry	10, 12, Oats; 11, Wheat and Oats	April 27th to May 1st	Oats alone 1½ bush. per acre *Mixture Oats* 1 *bush.* .. Wheat ¾ bush. .. Super 1¾ cwt. ..	Patchy and uneven	Fair at present. Rain needed
6. 3 and 4 S.W., 23½ acres	Light loam	Summer ploughed. Cultivated thoroughly	Fine and dry	Open and dry	Oats	May 9th to 12th	Oats 1¾ *bush.* .. Super 1½ cwt. ..	*Fair*, some malting	Fair
7. 7 and 8 N.E., 103 *acres*	Red clay loam with dark patches	Winter fallow, well worked	Fine and dry	Fine and good	Oats, 83 acres; Wheat, 20 acres	May 9th, 23rd, and 29th	Oats 1¾ bush. .. Wheat 65 lbs. .. Super 1½ cwt. ..	Fair; wheat malted slightly	Very good
8. South Blue-gum field, 90 acres	Clay loam *to loam*; patchy	Summer ploughed, *thoroughly* cultivated	Fine, occasional showers	Fair to good	Oats	May 12th to 26th ..	Oats 1¾ bush. .. Super 1½ cwt. ..	Slow but good	Fair, dependent on season
				D.—Grain Crops.					
9. 9, 10, N.E., South Blue-gum, 136 acres	9,10,clay loams; Blue-gum, grey loam	9, 10, fallowed and well worked; Blue-gum, sum-*mer* ploughed, well worked	Fine and dry, occasional showers	*Good* ..	9, 10, Wheat, 120 acres; Blue-gum, Barley, 16 acres, for seed	Wheat, May 14th to June 5th; Barley, June 15th to 16th	Wheat 65–70 lbs. .. Barley *70 lbs.* .. Super 1½ cwt. ..	Good to date	Should be good if *season* at all favorable

GRASSES, MISCELLANEOUS CROPS, ETC.

There has been set down this season 15 acres of grass mixtures, together with forty small variety plots, and it is intended to irrigate later. Small areas have been sown in pease, lucerne, and leguminous mixture; total, 23 acres.

EXPERIMENT AREA.

The total area devoted this season is 103 acres, made up as follows:—

	Acres.
Rotation Trial	13
Stud Cereals	5
Green Manurial	20
Fertilizer Tests	12
Top-dressing of Pastures	10
Seeding and Wheat Variety Trials ..	13
Experimental Pastures	10
Lucerne Experiment	20

Generally speaking, our seeding this year has been very satisfactory from the working stand-point of the farm, but rainfall has been scanty, and the crops will need steady falls in the near future to insure good returns.

The total area sown this year is approximately 739½ acres, of this total—

166 acres have been sown to forages.
196½ acres have been sown to hay.
136 acres have been sown to grain.
141 acres have been devoted to grasses, experimental fields, and miscellaneous crops.

2.—RUTHERGLEN EXPERIMENT FARM.

SEEDING OPERATIONS.

G. Harmer, Farm Manager.

During the present season out of a total area of 750 acres available for farming purposes, 369 acres have been sown to crop. This comprises the following:—

	Acres.
1. Wheat for grain	217
2. Hay	45
3. Oats for grain	40
4. Barley, rape, and pease (for feeding off with sheep)	53
5. Forages in Permanent Experiment Field (for *feeding to stock*)	14
Total	369

The seeding operations on the farm have been conducted under very favorable conditions this year, and, with one exception (12th May, when 122 points of rain were registered), no interruption has taken place in the course of the seeding. The downpour of rain on the 12th of May prevented the one-way discs from working. The spring-tooth cultivators took their place, and while these cultivators are fine implements to loosen the soil and make a good seed bed, they were not so effective for the eradication of weeds.

The germination generally has been good, but it is only what might have been expected, as the land has been kept worked through the summer months, and was well worked immediately before drilling. Any parts that appeared lumpy or harsh were rolled with a 10-foot roller, and were given special treatment so as to bring the whole of the land to an even state of tilth. By getting the whole area under wheat in the same condition a much better average grain is produced, as the whole of the plants ripen practically simultaneously, which saves trouble and loss of grain at harvest time.

The following varieties of wheat were sown during the period 28th April to 1st June, 1914:—

Huguenot.	Warden.	College Eclipse.
American 8.	Federation No. 1.	Yandilla King.
Marshall's No. 3.	Dart's Imperial.	Commonwealth.
Currawa.	Zealand Blue.	Federation No. 2.
Federation No. 3.	King's Early.	Firbank.
Gluyas.	Penny.	Triumph.

A break of eleven days occurred between the sowing of Federation No. 2 and Federation No. 3, on account of the rain.

The system of seeding is—Fallow well worked, a one-way disc or cultivator; harrows precede a 17-hoe drill. The wheat is sown at the rate of 70-75 lbs. per acre, with 100 lbs. of superphosphates. The harrows follow the drill.

A feature of the seeding is the area sown for feeding off with sheep. In last season's tests on the permanent experiment field the feeding off of forages, such as barley, rape, and pease, gave very satisfactory results, and the adoption of this practice on a larger area of the farm will doubtless lead to most satisfactory results.

The barley was sown early (30th March), and though the seed bed was somewhat dry, it germinated well, and is now being fed off with sheep and the dairy herd. The barley was sown at the rate of 80 lbs. per acre. The rape was sown in April at the rate of from 5 to 7 lbs. per acre, according to the tilth of the ground. This year it is very free from aphis, and as frosts have now set in, this pest will doubtless have no effect on the crop this year.

Two hundred and seventeen acres have been sown with bulk wheats for distribution among farmers. The seed for this is raised from selected seed grown in the "selection" and "seed plots" on the permanent experiment field. Each year the standard of prolificacy of each variety is raised by the selection of the best heads for next year's "selection plots."

The demand for seed wheat during the last season was very keen, and a large number of orders had to be refused. Moreover, a number of orders have already been booked for seed for distribution in 1915.

The sheep are all in excellent condition. There are 200 ewes, and lambing is proceeding in a very satisfactory manner. There is an abundance of barley, rape, and rye and vetches ready for feeding off.

The seeding of the Permanent Experiment Field is now practically completed. There are 100 acres in fields Nos. 1 and 2, and the whole of the plots are showing up satisfactorily. The tests comprise the following:—Rotation crop experiment, permanent manurial trials, cultural and tillage tests, selected wheat plots, variety wheat plots, green

manurial tests, feeding-off experiments, rate of seeding trials, and variety and manurial tests with peas, beans, oats, and barley, and stud cereal, selection, and cross-bred plots.

The rainfall for the twelve months is as follows:—

RUTHERGLEN RAINFALL.

	Inches.
1913.	
May	2.35
June	1.87
July	.53
August	1.58
September	2.88
October	1.83
November	.51
December	.34
1914.	
January	1.10
February	3.0
March	2.00
April	1.58
May	2.17
Total	21.74

3.—WYUNA EXPERIMENT FARM.

H. Baird, Farm Manager.

DRY FARMING AREA.

The present sowing season in this district has been an unusually dry one. The very moderate rainfall in the months of April and May, the exceedingly dry season, and the unfavorable weather in other respects during these two months have resulted in, at best, a very weak growth, and in some cases the seed has not germinated at all.

The following table indicates the monthly rainfall for the twelve months preparatory to the present seeding:—

	Inches.
1913.	
May	2.69
June	1.68
July	.62
August	1.24
September	1.68
October	1.51
November	.40
December	.45
1914.	
January	.27
February	.5
March	.6
April	.85
Total	11.50

The land, even that well-fallowed, was, therefore, at that time in a very dry state. The rainfall for April was 85 points, and for May, 109 points. This, under favorable conditions in other respects, was sufficient to insure a good germination, but unfortunately, each fall of rain was followed by cold, drying winds and frosty mornings which

had the effect of quickly drying the soil as, on account of the long dry spell previous to the rain in April and May, there was very little moisture in the subsoil and the result has been as stated.

The area put under crop or in course of preparation for seeding at Wyuna is 185 acres—wheat, 100 acres; oats, 20 acres; wheat and oats mixed, 32 acres; oats and legumes, 7½ acres; barley and legumes, 7½ acres; barley as covering crop for pasture grasses, 18 acres. On account of the dry state of the soil seeding was not commenced until 5th May, when the mixture of oats and legumes, and barley and legumes were sown.

The following varieties were sown:—Federation, College Eclipse, American 8, King's Early, Gluyas, Commonwealth, Currawa, Dart's Imperial, Bunyip, Firbank, Penny, Bayah, Comeback.

Sowing on fallowed land was commenced on the 16th May under fairly favorable conditions, as 105 points of rain had been recorded on the 13th of that month. The land had been well worked and was apparently quite moist enough to insure a good germination; but, as has been stated, the drying winds and frosts militated against this, and the result, so far, has been disappointing. The oats sown a few days earlier than the wheat have done better than the wheat, and this crop is well above the ground and looking fairly well.

On some of the local farms seeding was commenced at the latter end of March, and where any of the seed sown at that time has germinated at all, the crop is very patchy. Most of it has failed altogether, and in some cases the land has been resown.

One point that may be worthy of note is that the result has been much better where the land was harrowed after the drill than where the land was not so treated. This, I believe, is due to the seed having a deeper covering of soil, and being better protected from the drying winds that prevailed.

On the whole the present seeding time has been, so far, an unusually bad one. Farmers are having an anxious time and would gladly welcome a good soaking rain.

A number of interesting experiments are being conducted on the dry-farming section. Prominent amongst these are the following:—

Manurial Tests, in which thirteen different manurial applications are being tested.

Graded Seed Plots, to test the efficacy of graded seed as compared with ungraded seed.

Variety Wheat Plots, in which thirteen different varieties are being tested in blocks of 2½ acres upwards.

In addition to these, sixty different varieties of wheats, oats, and barleys have been sown in small plots, to test their suitability for dry conditions. In addition, fourteen new cross-bred wheats raised at the Rutherglen Experiment Farm are being tested, in order to prove their suitability or otherwise for Goulburn Valley conditions.

Five areas of pasture on what is known locally as "plain land" have been top-dressed with different fertilizers, with a view of determining their influence on naturally poor grazing country.

Fourteen acres of a mixture of peas and tick beans have been sown with barley and with oats, to test their suitability for forage purposes.

4.—LONGERENONG AGRICULTURAL COLLEGE.

Field Officer I. M. Tulloh.

At the present time the experimental plots cover an area of 33 acres, 5 acres of which are laid down in pasture manurial trials, 11 acres fallow for next season, and 17 acres set out for this season's experiments.

In this district, sowing commences, as a rule, considerably later than in other wheat-growing districts of Victoria. This is owing to the prevalence of wild oats, which must be allowed to germinate on the fallow after the autumn rains before scarifying. The rainfall for this year, till the end of March, was only 171 points, 42 of which fell in January, 88 in February, and 41 in March; hence there was practically no germination of rubbish on the fallow till the middle of April, when there was a rainfall of 2.24 inches, and wild oats and other weeds germinated readily. There was a marked difference in the germination of wild oats on the field 25B and 25E, for, while they came up very thickly all over 25E, there was a very thin germination on 25B. This may be due to the difference in the fallowing of the two fields. No. 25B was ploughed, harrowed, and sown in March, 1913, with rape and mustard, which was fed off and ploughed in September, while 25E was ploughed in July, and left bare fallow till sowing time; both fields were worked similarly after their respective ploughings in September and July.

At sowing time the first 4½ inches of soil on both fields were loose and moist, but at this depth the soil was hard and rather dry on 25B, while the subsoil of 25E was in good order, being moderately firm and very moist. No. 25E was scarified on the 13th May, and a portion of the west end was cross-scarified and laid down in forage plots, which were sown on the 14th with the following:—Dun peas, beerseem, sulla clover, peas, tick beans and vetches, rye and vetches, rape, kale and Italian rye grass, while manure was sown at the rate of 1 cwt. superphosphate per acre. The remainder of the field was harrowed on the 19th, and plots 1-120, and ten series of plots of first generation cross-bred wheats were planted on the 19th to 23rd.

No. 25B was scarified on the 23rd, and the "rate of seeding" and "graded seed tests" were sown on the 25th and 26th May respectively.

Each plot in these tests is sown with Federation seed, and manured with superphosphate at the rate of 1 cwt. per acre.

The "rate of seeding" test consists of six plots sown with various quantities of seed ranging from 56 lbs. to 120 lbs. per acre, and in three weeks' time a second series of these "rates of seeding" plots will be sown to determine the effects of the various quantities of seed per acre when sown late in the season.

In the "graded seed" test four grades of seed have been sown—two sowings of each of the following grades:—1st grade, 2nd grade, 3rd grade, and ungraded; two sowings of each grade being made to check the results. In this field there is yet to be sown a trial of barleys, consisting of eight plots, in which four Cape and four malting barleys are being tested. The barleys have done very well here during the

st two years—Roseworthy Oregon (Cape) yielding 80 bushels per re last season, and Gisborne (malting) yielding 62 bushels per acre. he remainder of 25E was cross-scarified on the 27th, and the manurial ials, seed selection tests, and trial of fifth generation new cross-bred heats were sown on the 28th, 29th, and 30th respectively.

In the manurial trials there are fifteen plots, each of which was sown ith Federation seed at the rate of 75 lbs. per acre. In this test the llowing trials of manures are being carried out:—

- Superphosphate sown at rates varying from 56 lb. to 2 cwt. per acre.
- Super with Lime sown at rates of 5 and 10 cwt. per acre.
- Super with Nitrate of Soda sown together, and also as a top-dressing in spring.
- Thomas' Phosphate.
- Thomas' Phosphate in conjunction with Superphosphate.
- Super with Nitrate of Soda and Sulph. of Potash.
- Farmyard Manure.
- (Three plots have been left unmanured to act as check plots.)

The seed selection test consists of fifteen plots. Three of these plots ve been sown with selected Federation, while the remaining twelve ots have been sown with selected seed of the following varieties:—

American 8.	Dart's Imperial.	Marshall's No. 3.
Commonwealth.	Currawa.	Bayah.
Viking.	Bunyip.	College Eclipse.
Gluyas.	King's Early.	Yandilla King.

Each year sufficient selected heads are chosen from each plot to w a similar plot the following season, so that these plots act not only a trial of the various varieties, but also serve for the production of lected seed wheat.

In the trial of the fifth generation cross-breds, eight promising oss-breds have been sown, while two plots of selected Federation ve been sown with them to check the returns.

The seed for the season's sowing was pickled in formalin 1 to 400, ing immersed in the solution for four minutes.

The soil was in first class order at the time of sowing, and the eather was very favorable for killing weeds; so that there is every ospect of the resulting crop being an exceptionally clean one.

THE INFLUENCE OF SALT ON PLANTS.

By Alfred J. Ewart, D.Sc., Ph.D., Government Botanist and Professor of Botany and Plant Physiology in Melbourne University.

The following experiments were carried out on small plots primarily to determine the after-effect of a salt dressing and how long the effect takes to disappear.

When salt is added to the soil, it may act in various ways upon crops. When in excess, it tends to form with the soil particles impermeable crusts, which interfere with the aeration of the soil. In addition, it raises the osmotic concentration of the soil-moisture, and so tends to make the soil physiologically dry to the plant roots, even while it still contains a fair percentage of free moisture. These actions will be feeble when the rainfall is abundant, but pronounced when it is scanty.

In addition, a solution of common salt increases the solubility of many of the mineral constituents present in the soil, and, in so far as these are food substances, the addition of salt will act as a liberating or exhaustive manure, as distinguished from a replacing or food manure. Although salt itself is not generally considered to be a food substance to plants, it is always present in the ash, and, since it is capable of influencing certain oxidase actions, it may also affect the respiration and growth of the plant.

The plots were arranged in rows, each series receiving progressively increasing amounts of salt applied in May, 1912, after a previous dressing of magnesium sulphate at the rate of ½ cwt. per acre. The plants selected for the tests were rye grass, lucerne, field pea, rape, Toowoomba canary grass, rye grain, wheat, and silver beet. The first harvesting took place in September to October. The plots were then covered with a uniform dressing of calcium superphosphate (2 cwt. per acre), chalk (½ cwt. per acre), and potassium nitrate (½ cwt. per acre). In the second year, no more salt was added, but the order of succession was as follows:—

1912.	1913.
Lucerne	Rye grass
Rye grass	Lucerne
Rye	Field pea
Silver beet	Rape
Wheat	Toowoomba Canary Grass
Rape	Rye grain
Toowoomba Canary Grass	Wheat
Field pea.	Silver beet.

The planting and harvesting took place as in the previous year, the crops being weighed while green and before they were fully ripened.

The salt used contained no potassium, phosphoric acid, nitric acid, or iron, but contained calcium, magnesium, and sodium sulphates, as follow:—

Calcium (calculated as CaO) 0·235%.
Sulphuric acid (calculated as SO_3) 0·657%.
Magnesium (calculated as MgO) 0·13%.

These amounts were not sufficient to affect the physical action of the salt, and the previous general application of magnesium sulphate, at the rate of ½ cwt. per acre, ensured that the magnesium in the salt could exercise no appreciable stimulating or nutrient action on the crops.

The rainfall is, of course, a most important factor in determining both the direct physical action of a dressing of salt and the duration of its indirect after-effects. The following data in regard to the monthly rainfall at Melbourne for the period under investigation were supplied by the Commonwealth Meteorologist:—

1912.

April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
233	135	127	201	166	235	132	237	356	points.

1913.

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	
37	119	514	135	311	143	70	185	138	147	points.

The total rainfall was, therefore, 35½ inches during the nineteen months period covering the two crops, and the average monthly rainfall was 87 points. The following table gives the results and shows clearly that in all cases moderate dressings of salt distinctly increased the yield in the first year, but that with increasing doses this was ultimately replaced by a decreased yield. Lucerne and field peas were the most sensitive to salt, then rye grass, rape, and canary grass, then wheat, next rye, and, most resistant of all, silver beet. In the latter case, the leaves became distinctly salt, and plants from the different plots could be told fairly well by tasting the leaves. The beneficial action of a moderate dressing of salt will naturally only be shown where the soil is not too dry, and is probably largely due to the solvent action of the salt upon the mineral constituents of the soil. In all cases, strong dressings retarded germination, and the failure to produce a crop in some of the plots was due to germination being retarded until the seeds rotted, as well as to a direct injurious action on the young seedlings.

ESTIMATED YIELD IN TONS PER ACRE AFTER APPLICATION OF SALT.

—	Control on Salt.		2 cwt. of Salt per Acre.		4 cwt. per Acre.		8 cwt. per Acre.		16 cwt. per Acre.		32 cwt. per Acre.		64 cwt. per Acre.	
	1st Year.	2nd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.	1st Year.	2nd Year.
Lucerne* ..	0·46	2·25	0·68	3·75	1·0	4·25	0·62	2·87	0·31	1·32	0·03	0·03	0·015	Nil
Rye Grass ..	2·06	1·12	2·06	0·62	4·0	0·5	3·67	0·56	3·18	1·87	1·56	1·69	1·18	2·5
Rye	4·93	6·44	5·31	7·75	7·5	7·62	5·87	7·62	8·93	7·62	5·5	9·19	0·25	7·75
Silver Beet ..	0·68	2·32	0·56	2·25	1·25	6·0	1·18	3·37	1·18	1·81	2·18	1·75	8·72	1·87
Federation Wheat	1 36	1·87	2·36	3·44	2·31	†1·62	6·72	3·25	6·68	2·12	6·18	3·97	Nil	4·5
Rape ..	1·43	3·12	2·18	3·37	3·31	5·62	2·12	6·32	3·43	6·25	3·0	7·25	Nil	0·06
Toowoomba Canary Grass ..	2·36	4·19	3·18	6·12	4·25	6·56	4·12	‡3·32	6·5	7·5	7·0	7·75	Nil	6·56
Field Pea ..	9·12	5·12	13·18	7·0	9·0	6·5	6·72	6·5	6·12	4·5	0·92	4·87	Nil	2·75

* First cut only. In the first year the stand was poorly established.
† Badly rusted.
‡ Damaged by insects when young.

In the second year insufficient salt remained to directly injure the crops. Thus good yields were given by rye grass, rye, Federation wheat,

and Toowoomba canary grass on the 64 cwt. per acre plot; by rape on the 32 cwt. plot; and by field peas on the 8 cwt. per acre plot. Curiously enough, the silver beet, which is the most resistant to salt, in the second year did best on the 4 cwt. per acre plot, possibly as the result of the exhaustion of the soil in the highly dressed plots.

In the following table, the average yields in each year are given for the salted plots as a whole, and also the total averages for the two years:—

—	Control.			Average yield on Salted Plots.		
	1912.	1913.	Total.	1912.	1913.	Total.
Rye Grass ...	2·06	1·12	3·18	2·64	1·29	3·93
Rye... ...	4·93	6·44	11·37	5·56	7·92	13·48
Silver Beet ...	0·68	2·32	3·0	2·51	2·74	5·25
Wheat ...	1·36	1·87	3·23	4·04	3·15	7·19
Rape ...	1·43	3·12	4·55	2·34	4·71	7·05
Canary Grass...	2·36	4·19	6·55	4·17	6·3	10·47
Field Pea ...	9.12	5·12	14·24	5·99	5·35	11·34
Lucerne ...	0.46	2·25	2·71	0.44	2.04	2.48
Totals ...	22·40	26·43	48·83	27·69	33·50	61·19

When salt is present in a soil or accumulates in the irrigated soils of districts with a high rate of evaporation as the result of seepage and imperfect drainage, the distribution of the salt is never uniform. If the above plots had formed, a field with equal areas, containing 2, 4, 8, 16, 32, and 64 cwts. of salt per acre, a chemical analysis of samples would have indicated an average of 21 cwt. per acre. Nevertheless, except in the case of lucerne and field pea, the average yield for the salted plots was greater in both years than for the unsalted controls, and the total yields for all the plots were also greater in the former case.

The injurious action of salt is mainly an osmotic one. It raises the percentage of water at which the soil becomes physiologically dry, and this action is naturally more pronounced with freely transpiring plants, such as peas and lucerne, than with drought-resistant ones, such as rye and wheat. It also depends largely upon the rainfall. Thus the lightly dressed plots germinated, in the first year, during May, for the most part (135 points of rain), whereas the heavily dressed ones had their germination delayed until after heavy rains, at the end of June and beginning of July (127 and 201 points), the seedlings then growing strongly except in extreme cases.

The stimulating action of a moderate dressing of salt is partly due to its solvent action on the mineral constituents of the soil, and is possibly partly due to the absorbed salt acting as an oxidase sensitiser or katalytic agent in plant metabolism.

Even heavy dressings of salt up to 64 cwt. per acre appeared, if anything, to favour the development of such weeds as goosefoot, wood rush. pimpernel, and hogweed. Prairie grass survived with a dressing of 64 cwt. per acre, and the South African wood sorrel grew in special abundance. Heavy dressings of salt benefit various weeds rather than

cultivated plants. The injurious action of a dressing of 64 cwt. of salt per acre was still perceptible in the second year, after a total rainfall of 35 inches, with field pea, rape, and lucerne, but becomes practically imperceptible, or even shows a slight beneficial action, with rye grass, rye, wheat, beet, and canary grass. The apparent slight beneficial action may, however, be due to the fact that in the previous year these plots were compulsorily fallowed. The only 64 cwt. plot which gave a high yield in the first year (silver beet) gave an almost negligible yield of rape in the following season, indicating that where the addition of salt increases the yield, it does so at the expense of the food materials present in the soil, and therefore acts as an exhausting, and not as a replacing manure.

SULPHO-CARBONATE OF POTASSIUM AS A SOIL INSECTICIDE.

By F. de Castella, Government Viticulturist.

In *Le Progres Agricole* of 22nd March last, M. E. Molinas devotes an article to the destruction of soil parasites. Much havoc is wrought annually in our vineyards, orchards, and farm crops by animal parasites such as cut worms, white ants, eel worms, cockchafer grubs, slugs, snails, and other pests, too numerous to mention. Nurseries, market gardens, and growers of small fruits are, perhaps, the greatest sufferers, and to these, more particularly, the conclusions arrived at in the article under review, may prove of interest.

M. Molinas dismisses cyanide of potassium as being too deadly a poison to be placed in the hands of agriculturists; he further charges it with a depressing influence on vegetation. In his opinion, the most advantageous soil insecticide is sulpho-carbonate of potassium.

Though little known, and not commercially obtainable in Australia, this is by no means a new insecticide, but one which has been largely, and often successfully, used to combat phylloxera, prior to reconstitution on resistant stocks, in the days when insecticide treatment seemed to be the only hope of the vine-grower. In stiff soils, unsuited for carbon bi-sulphide treatment, sulpho-carbonate gave more satisfactory results.

It was first recommended, for this purpose, by Dumas in a communication to the French "Academie des Sciences," in 1874. As was then pointed out, this substance, which is a compound of bi-sulphide of carbon and potassium sulphide, is decomposed slowly when acted on by carbonic acid, and converted into carbonate of potash, sulphuretted hydrogen, and carbon bi-sulphide.

$$K_2S.\ CS_2.\ H_2O + CO_2 = K_2CO_3 + H_2S + CS_2$$

The two last-named are powerful insecticides, and the fact that they are liberated progressively, during a prolonged period renders the insecticide action all the more durable and complete. The carbonate of potash acts, of course, as a valuable manure.

In the pure, dry state, sulpho-carbonate of potassium contains 40 per cent. carbon bi-sulphide and 60 per cent. potash; the commercial preparation, however, is a deep red, syrupy liquid, of from 33 degrees to 42 degrees Beaumé (s.g., 1.283 to 1.392), containing from 14 to 16 per cent. CS_2 and 18 to 20 per cent. potash.

M. Molinas' experiments were carried out at the Antibes School of Agriculture, in the French Riviera, where flower culture is a leading industry. Cut worms and slugs were devastating carnation and tulip beds. To quote the writer of the article, "My trials of sulpho-carbonate of potassium were conclusive. I found that with a dose of 1 per cent. by volume (1 litre of commercial solution to 100 litres water) slugs and cut worms were quickly killed. . . . The solution was applied by means of a watering-can, without rose, in the case of carnations, the roots of which were the objective; with a rose in the case of tulips, since the whole surface of the bed required treatment. . . . When the tulips were hoed, a fortnight later, very numerous dead slugs were found, conclusive proof of the efficacy of the treatment. . . . The slightly viscous liquid seems to act, in some cases, as much by contact as by liberation of asphyxiating gases. Thus earth worms, surprised whilst creeping on the surface, wriggle as soon as wetted with the solution, and soon die. . . . Sulpho-carbonate presents the advantage over carbon bi-sulphide, of acting more slowly and for a longer time; of thoroughly wetting the mass of soil to which it is applied; of persisting during several days; and of sparing no parasite. . . . The most active insects fail to escape if sufficiently deep in the soil. All soils lend themselves to the treatment, whether clay, gravelly, or sand, the quantity of liquid to be applied alone varies.

"Tulips and carnations do not suffer from a dose of 1 per cent. or even 2 per cent. It is only when 5 per cent. is reached that carnations show signs of suffering. But there is no need to exceed 2 per cent. Sulpho-carbonate, a by-product of carbon bi-sulphide manufacture, costs 38-40 francs per 100 kilos. (£15 4s. to £16 per ton) at the factory (in France). It weighs about 1,200 grammes per litre (12 lbs. per gallon). The cost does not thus seem high, and it would be logical to deduct the manure value of the potassium carbonate." It is further pointed out that this substance is of no use for application above ground—"only underground parasites should be aimed at."

Notwithstanding the above, the cost of the treatment would appear to be high, owing to the considerable quantity of liquid which has to be applied. "The essential condition is to saturate the bulk of soil to be treated, to the depth at which the parasites are to be found. Copious applications must thus be made."

This was, in fact, the main drawback to its use as a means of combating phylloxera. The application of the large bulk of water necessary to bring it into thorough contact with the insect usually proved more costly than the insecticide itself.

This would, no doubt, militate against its use on a large scale. It is where small areas have to be dealt with that it may prove useful—in the nursery, where stock of considerable value is grown in a small compass, or in market gardening. Even on a larger scale, it may prove of service in an emergency, or as a local insecticide against such pests as cut worms or white ants, and, possibly, also against root borers.

That sulpho-carbonate is very deadly to the lower forms of animal life is further evidenced by the fact that in Switzerland it is still the standard phylloxera disinfectant, planters of new vineyards being compelled to dip their young vines, before planting them, in a solution containing 3 per cent. sulpho-carbonate and 1 per cent. soft soap.

Being so little known in Australia, the following note as to its preparation, for which I am indebted to Dr. Faes, of the Lausanne (Switzerland) Viticultural Station, will, no doubt prove of interest:—

Directions for Preparing Sulpho-carbonate Solution.

A solution of caustic potash is made to absorb sulphuretted hydrogen *until saturated.* *To 1 kilo of this product* (K.S.H.), *which contains* 38.1 per cent. of K.S.H., 800 grammes of a 37 per cent. solution of K.O.H. is added. A solution of K_2S is thus obtained, which contains 58.2 per cent. of K_2S. This solution is concentrated to a pasty consistency, and to it is added, at a temperature of 40-42°C., with frequent stirring, 400 grammes of CS_2, which dissolves completely after three hours. We have thus obtained a solution which contains 400 grammes of CS_2. This solution of thiocarbonate of potash is diluted so as to obtain a solution containing 7 per cent. of CS_2. This solution would be about one half the strength of the commercial sulpho-carbonate used by M. Molinas.

THE USE OF LINSEED OIL ON THE FARM.

Raw linseed oil, just as expressed from flax seed, either Calcutta or Australian, is the best for application to wood, enhancing its durability and preventing decay, as well as making it wear smoothly to the hand. The oil fills up all pores in the wood, congeals there, and prevents the entrance of moisture and fungoid spores.

All farm and garden tools made of wood, or having wooden parts or handles, when new, should be washed clean of all dirt, and then as much raw oil as they will absorb should be applied by means of a flannel, rag, or a brush, choosing a hot day for the purpose. They should be placed in the sun, and as the oil dries more should be given until they are saturated. Rake, spade, pick, axe, handles, &c., treated in this manner will outlast even the steel parts, if the tools are kept sheltered from the weather when not in use. Carpenters' and small wooden tools should be dealt with in the same way.

Farm vehicles, wheels, and wooden machines have their life much prolonged by an annual application of raw oil. Every farmer and gardener should keep a drum or bottle of this oil ready on the premises: its cost will be returned many times over. Those who try its valuable qualities never cease to use it.—(*Communicated.*)

A DISEASE OF THE WATTLES OF FOWLS.

By H. R. Seddon, B.V.Sc., Melbourne University Veterinary School.

The following is an account of a disease of the wattles of fowls investigated by the author at the Melbourne University Veterinary School, and proved to be due to a specific microbe which, in many respects, on bacteriological examination, behaves in a manner exactly similar to that causing fowl cholera.

The "wattle disease" appears to be a localized form of fowl cholera, in which the causal microbe gains entrance into the wattles and remains there, giving rise to two very marked symptoms—(1) *enlargement*, due to the presence of inflammatory fluid, and, later (2), *distortion*, with the formation of hard nodules of cheesy material in the wattle.

Acute form of Disease—Note the marked thickening of the Wattle.

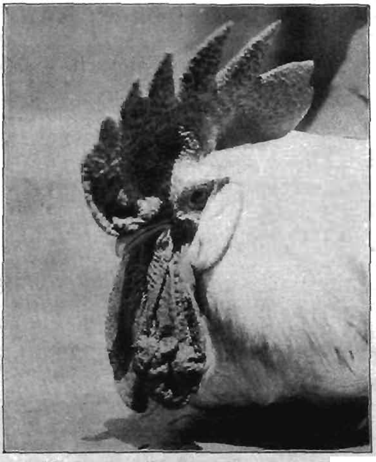
Chicken cholera, it may be mentioned, presents three distinct forms. (1) In the first, the bird may be found dead, no symptoms having been observed by the poultry-keeper. Such rapidly fatal cases usually occur at the beginning of an outbreak of the disease. (2) In the next type of the disease diarrhœa is the most marked symptom, and death results in from one to three days. (3) The third, or chronic, form, usually occurs in birds which have recovered from the second form, and is manifested by swelling of joints, muscular weakness, and wasting, and may extend over several weeks.

In the localized form in the wattle the microbe probably enters through wounds in that organ gained while scratching or fighting. In

the cases investigated, White Leghorns were affected, but it is probable that any breed with large wattles would be liable to the complaint. For the same reason, cockerels suffer more frequently than hens. The disease was communicated experimentally to healthy birds by rubbing cultures of the microbe on wattles which had been scratched lightly with a needle.

SYMPTOMS.

The first symptom to be noticed is that one or both wattles or portions of them are much swollen, dark-red in colour, and, though hot and tender at first, soon become cold. The swelling is due to oedema, or inflammatory fluid, within the wattles, and small beads may be observed oozing from the surface. By this time birds manifest symptoms of general illness, such as ruffling of feathers, loss of appetite, and also often show an acute inflammation of the eye (usually on the same side), manifested by a gluing together of the eyelids with some discharge of yellowish pus.



Chronic form of Disease—Note the distorted appearance due to the fissures in the Wattle.

Affected birds may die during the first few days of illness (acute form), but in the great majority of cases the disease becomes chronic. When the bird dies in the acute form, the microbe has passed into the blood. This may be shown by injecting a few drops of blood from a fowl just dead under the skin of another fowl, when this bird will die in from eighteen to thirty-six hours.

In the chronic form the wattle soon becomes hard and wrinkled, due to absorption of the fluid present in the acute stage. Later nodules of cheesy material form in the wattles, and there may be seen thick scabs,

often almost embedded in fissures of the surface. These latter mark old scars—probably those where the microbe gained entrance.

These much-crinkled wattles may remain in this condition for a considerable time, even months, and are a source of danger, inasmuch as the causal microbe may still be present in them, multiplying there and capable of spreading the disease when the scab finally falls off. Thus the bird may, apparently, recover, yet be a "carrier" of the disease. It may be mentioned here that this microbe is also capable of causing a fatal diarrhœa (like fowl cholera) in chickens.

The disease has been known to affect over fifty birds in one run, the mortality being about 5 per cent. It is not only actual deaths that are serious from a poultry-keeper's point of view, but also the great disfigurement of birds which survive—a very serious matter in pure-bred stock.

TREATMENT.

Affected birds must be at once isolated, and as soon as signs of active inflammation have disappeared, the wattles should be "cropped"—that is, removed with a sharp knife. Such an operation, of course, causes disfigurement, but the spread of the disease is checked, provided all the affected material be burned.

The fowl-house and run should not escape attention. These should be thoroughly cleaned up, droppings and rubbish should be burned, and the nests, shed, and feed or water troughs disinfected. If possible, the yard where the affected birds have been running should be dug up. In a poultry run where fifty birds were affected during one autumn, the owner, after adopting such measures, suffered no loss at all for some months, when three hens became affected. Digging up the yard where these birds had been running, and top-dressing with lime those parts where the fowls chiefly congregated, again resulted in a disappearance of the complaint.

ITEMS OF INTEREST TO BUTTER FACTORY MANAGERS.

R. T. Archer, Senior Dairy Inspector.

CREAM CANS.

It is now 25 years since the inauguration of the system of co-operative butter factories in Victoria, and I recognise many cream cans in use at the present time of makes that were popular in the early years of the butter factory system. What wonder, then, that many of these old servants are now worse for wear, and have lost their coat of tin, which alone made them suitable for use for cream. The majority of dairymen do not seem to realize this, but continue to use them long after they are unsuitable, and I feel sure that managers will agree with me that a large percentage of the inferior butter which is turned out of our factories is due to this fact. It will be remembered that about two years ago copies of a regulation (given below) under the Pure Foods Act,

giving supervisors power to deal with this trouble, were sent to all the butter factories in the State. I know that many managers got reprints of this and sent them to their suppliers. This notification did not have the desired result in causing the defective cans to be kept at home; a great number are still being used to send cream to the factories. Apart from the hygienic aspect, all are aware of the bad effect that rusty cans have on the quality of cream kept therein and butter made therefrom. If proof is required, it is available in experiments conducted by Mr. Crowe two or three years ago, also in experiments conducted later in America. Any one who may be in doubt as to the effect should take a rusty cream can, scrub and clean it as well as he is able, then steam it and smell it. The most sceptical would be convinced.

QUALITY OF CANS.

Years ago the cheaper class of cans, *i.e.*, those with galvanized hoops, *were made of better quality material than that used in the cheaper* cans to-day. I have seen cans only once used spotted with rust where there was no tin on the plate. These cans will last but a short time, and cannot be repaired satisfactorily. On the other hand, strong steel cans with tin hoop at bottom, and perhaps the same at the top, are better material, having a good coat of tin, and even when this is worn off they can be re-tinned and made equal to new for little more than half cost. In some factories where the latter class of can preponderates we find very few bad-conditioned cans, and the quality of the cream is better in consequence.

The policy of the Department is to seize those cans used for supplying cream, which are not fit for the purpose; to perforate them in such a way that they may not be used again for milk or cream; and then to return them to the original owner, knowing that they can be used for bread tins, feed boxes, &c. Should the cans be of such material and in such condition that they could be profitably repaired, one of the following notices, as the case may be, is inserted in the can and returned to the owner:—

DEPARTMENT OF AGRICULTURE.

DAIRY SUPERVISION BRANCH.

NOTICE.

This Can requires a New Bottom.

If this can is continued in use, the bottom will shortly attain such a condition as to warrant seizure with or without the contents. (See Regulation printed on the other side.)

In addition to loss by seizure, you render yourself liable to a penalty not *exceeding £10.*

Butter made from cream kept in a rusty vessel will be reduced in value a penny to twopence per pound.

A can of cream averages 40 lbs. of fat. This, at one penny, equals 3s. 4d. loss each time the can is used.

The cost of a new bottom is about 5s.

Only heavy-tinned steel cans—cost about £1—should be used. They can be made equal to new by re-tinning when rusty.

....

Supervisor.

/ /

DEPARTMENT OF AGRICULTURE.

DAIRY SUPERVISION BRANCH.

NOTICE.

This Can requires Re-tinning.

If this can is continued in use, it will shortly attain such a rusty condition as to warrant seizure with or without the contents. (See Regulation printed *on the other side.)*

In addition to loss by seizure, you render yourself liable to a penalty not exceeding £10.

Butter made from cream kept in a rusty vessel will be reduced in value a penny to twopence per pound.

A can of cream averages 40 lbs. of fat. This, at one penny, equals 3s. 4d. loss each time the can is used.

The cost of re-tinning is 9s. to 11s. 6d.

Only heavy-tinned steel cans—cost about £1—should be used. They can be made equal to new by re-tinning when rusty.

. . . .

Supervisor.

/ /

On the reverse side is the following:—

Extract from the *Victoria Government Gazette* of 9th October, 1912, pp. 4122-3.

Pure Foods Act 1905.

Regulations to secure the Cleanliness and Freedom from Contamination and Adulteration of Milk or Cream.

The Board of Public Health of the State of Victoria, by virtue of the powers conferred by the Health Acts, and of every other power enabling the said Board in this behalf, doth hereby make the Regulations following, that is to say:—

MILK CANS CLEAN AND IN GOOD REPAIR.

1. No person shall use or allow to be used any milk can or vessel for the preparation, storage, carriage, or delivery of milk or cream, or any other preparation of milk, unless such milk can or vessel is kept in a clean and wholesome condition, and in such a state of repair as to prevent leakage, and as to be free from dents such as would interfere with the easy and thorough cleansing of such milk can or vessel, and it shall be provided with a properly fitting lid so as to prevent leakage.
2. No person shall stop any hole or crack in any milk can or pack or stop any improperly fitting lid with paper or soap or rags or other temporary stopping of a like nature.
3. All milk cans or vessels used in the transport of milk from the place of production to the retail vendor shall contain the name and address of the producer legibly inscribed thereon.
4. Any person contravening these Regulations shall be liable to a penalty not exceeding Ten pounds, and all milk cans or vessels not complying with such Regulations shall be liable to seizure by an officer of the Board, or by any officer of any Municipal Council, and such seizure may be made either with or without the contents therein.

These Regulations shall take effect from the first day of October, 1912.

Dated at Melbourne this 26th day of June, 1912.

By order of the Board of Public Health,

T. W. H. HOLMES,

Secretary.

CLEANING CANS AT THE FACTORY.

When the suppliers have been persuaded to secure suitable cans, they should be properly cared for. Frequently this important point is neglected at the factory, where there is every facility for properly cleansing the cans, whereas on the majority of farms there is not. Frequently cans are returned not half washed, being coated with stale cream. This is a bad example to the farmer, and we cannot be surprised if he is neglectful in cleaning his separator, &c., when those at the factory do not think it worth while to properly clean the cans. If hot water and soda and a brush are properly used, and then both cans and lids thoroughly steamed, considerable improvement would be effected. This is one of the details that requires a little more of the manager's supervision.

PROTECTION OF CANS.

When the cans are steamed they should be placed on racks upside down to drain and dry. There is no need to dry them, but when the lids are placed on before they are dry the cans are damaged. Many factories have excellent facilities for the care of the cans. Proper provision should be made at the others. The farmer should be advised never to place anything hard inside the cans, nor scour with sand or anything that will scratch or remove the tin. Also when not in use, say, during the winter, to rub them over with vaseline to prevent them rusting.

MILKING MACHINES.

A few points about the milking machine are worth discussing here.

There are about fourteen different designs of milking machines in this State, and, as far as can be ascertained, about 2,000 farmers have been supplied with one or other of them. Some of these have been put out of use for various reasons considered below.

The principal advantage of the milking machine is that it makes a farmer practically independent of labour, which is a difficulty where any number of cows have to be milked. When the machines are properly handled by those who take an interest in them, they give thoroughly satisfactory results. Especially is this the case with heifers first broken in to the machines. When used intelligently it is found also that the milk keeps well, which is of the greatest importance in connexion with butter or cheese making. That this should be the result with proper handling is proved by the experience at Mr. Hope's farm, from which the milk supplied to the Lady Talbot Institute, for feeding infants, is obtained.

There, under efficient supervision, and where the conditions were equally favorable, better results were obtained by the machine, from a bacteriological point of view, than by hand milking. It only remains, then, for those in charge to realize the precautions necessary and to adopt them accordingly. All users of these machines agree that there is infinitely less trouble with sore teats than when hand milking is practised.

Some of the results obtained will be of interest. During the years 1911 and 1912, for the months of March, April, and May, the average

bacterial counts were 23,800 and 18,700 respectively, per cubic centimetre of milk. Or, leaving out the highest count each month, the averages were 15,100 and 5,600 for the respective years. To show the effect of a little carelessness in another investigation (not on the Talbot farm), on several occasions the teat-cups fell off into the bedding, the result being that the bacterial count went up to 4,800,000 per cubic centimetre. It will then be seen that in careless hands the milking machine is a menace. It must be carefully and regularly cleaned. If the instructions generally given by the makers be attended to there should be no difficulty. The system of cleaning at the Talbot Institute is found to be satisfactory. Immediately after milking cold water is passed through the apparatus to rinse the milk out before it has time to dry. All the teat-cups and rubberware are then boiled twice daily in a 10 per cent. solution of washing soda, and left in the sterile water between milkings. Immediately before being used they are blown through with dry steam. A solution of formalin 2½ per cent. strength has been found satisfactory to keep the teat-cups and rubbers in between milkings. Once a week the vacuum tank and pipes should be thoroughly cleaned, for it is found that milk gets into the vacuum system, causing it to foul, and when the taps are turned on the buckets become contaminated. There is now on the market an all-metal cup which reduces the rubber to one single short tube. This promises to be a great improvement.

THE RUTTER PROCESS FOR STERILIZATION OF MILK, ETC.

A few weeks since attention was drawn in the daily press to this process, and I think it promises to be of the greatest importance, not only to the milk supply for cities, but also to butter and cheese factories. It is a simple and inexpensive process by which milk or cream is rendered absolutely sterile by the addition of two chemicals which, during the process, become changed in such a way that they are practically eliminated from the milk. Moreover, the chemical composition of the milk itself is not changed. In the United States of America, Canada, and New Zealand extensive experiments are being conducted in the pasteurization of milk for cheese making; but the comparatively high temperatures, necessary to destroy the bacteria present, have the effect of precipitating much of the mineral matter, and, without further treatment, difficulty is experienced in getting a firm curd. With the Rutter process sterilization is achieved at such a temperature that it has no effect on the chemical composition, the percentage of mineral matter remaining the same throughout. Of course, experiments will have to be conducted with regard to starters, rennet, &c., required, but it should be the means of making a uniformly good cheese.

With regard to cream also, it should have a great future. We know that pasteurization destroys the living bacteria, but not the spores, and these will develop when the temperature becomes suitable. A good starter, of course, has the effect of keeping these in check; but it would be far preferable if these spores were destroyed also, and this is what the Rutter process does. The cream would have to be heated to 125 degrees Fah., as against 180 degrees under pasteurization. This alone represents an enormous saving of steam, which means fuel. It has one drawback, which it shares with pasteurization. It will not enable you to make good butter out of bad cream; but it sterilizes the bad cream and prevents it becoming worse.

THE STRAWBERRY.

(Continued from page 334.)

By Edwin Meeking, Orchard Supervisor.

APPROVED VARIETIES.

The most widely-grown variety of strawberry in Victoria at the present time is the Melba. This excellent and deservedly popular berry is supposed to have been raised by Mr. Horton, of Parramatta, New South Wales, and was locally known as Horton's Seedling. Mr. F. Wilson, a Doncaster orchardist, while on a visit in 1899 to New South Wales, saw the plants and fruit growing at Mr. Horton's. He readily recognised its superior qualities, and secured a few plants. He grew these with much success at Doncaster, and soon discarded all other varieties. He found that it responded readily to irrigation, and was a very prolific cropper. The fruiting period was also much longer than any other variety then cultivated. The characteristics of the berry were its deep red colour, its excellent flavor, its small core, and firmness of texture. It soon became widely distributed, and before long was a very favorite variety. As proof of the profit to be derived from its careful and proper cultivation, Mr. Edwin Wilson, another well-known Doncaster grower, obtained one season, with the aid of irrigation, from seven-eighths of an acre, a nett return of nearly £200. This was from two-year-old plants. In the irrigated areas of the north, the closer settlers cultivate this variety almost exclusively, with splendid results.

At Red Hill, until lately, and probably still, the most extensive strawberry district in the State, a variety known as the Sunbeam gives the best results. In the opinion of many experienced growers it has superior qualities to the Melba. The plant withstands drought well, and also gives enormous results under irrigation. One of its chief virtues is its habit of bearing its fruit compactly near the centre of the plant, thereby ensuring protection by the foliage from the scorching sun. So many strawberry-growers know to their cost the disastrous effect of a broiling sun upon the ripe fruit. The fruit is rather round in shape, of a dull-red color, and has an excellent flavor. Its flesh is firm, and it is, therefore, a good "carrier." The variety was raised by Mr. Henry Prossor, fruit-grower, of Red Hill, who furnishes the following very interesting description of its history:—"This fine variety is a cross between Trollope Victoria and a very vigorous, but not generally known, variety, named Nelius. The object of the raiser was to secure the fine quality and appearance of the Trollope and the robust habit of the Nelius. The result has been eminently satisfactory, the Sunbeam having all the desirable characteristics of both parents. It has been tried for several successive seasons in a variety of soils in this district, and has never yet failed to produce a profitable yield. In favorable seasons it will bear without a break from the end of October to the middle of February, without the aid of irrigation, the plants carrying a good crop of fruit and remaining in full bloom during the whole period. The fruit is better protected by the dense foliage than any other kind with which I am acquainted, and it has a tremendous root development—a great advantage, as the plants are not easily injured by the cockchafer

grub or the horse-hoe. It is almost immune from the various fungus diseases common to strawberries. The colour and lustre of the fruit is excellent, and there is no variety in Victoria that can compare with it in flavor. The plant attains such a large size that plenty of room is essential. It should never be planted closer than 3 feet between the rows."

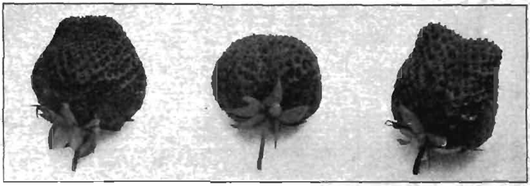
Under irrigation the Sunbeam gives wonderful results. Mr. C. H. Laurissen, of Red Hill, already alluded to in the present article, and a general view of whose plot is shown here, confines his attention almost wholly to Sunbeams. On the summit of a small hill, having an area of about three-quarters of an acre—or, to be exact, of 7 square chains, one half a square chain less than three-quarters of an acre—Mr. Laurissen is the fortunate possessor of a never-failing fresh-water spring. This spring has a flow sufficient to effectively irrigate the 7 square chains.

Fig. 2.—Irrigated plot of "Sunbeams," comprising 7 sq. chains, the property of C. H. Laurissen, Glenburnie, Red Hill, Victoria.

The accompanying illustration shows Mr. Laurissen's method of distributing the water. This is done by simply digging a very shallow gutter between several rows—about six at a time—then cutting shallow cross channels about 6 feet apart. When every portion of this area is saturated with water, the water is diverted into another six rows, and so on in succession, till the whole has been irrigated.

Other varieties of strawberries that have long been favorably known, and deservedly so, are La Marguerite and Edith. Mr. Joseph McIlroy, of Red Hill, one of the largest strawberry growers in the State, has grown for many years few other varieties than La Marguerite and Edith. The former is a very showy berry, both in color and size. A punnet of first-grade Marguerites, carefully packed, is a very attractive sight.

But in quality, I think they do not compare with either Sunbeam or Melba. In regard to the bearing propensities of the plants, they also fall short of the varieties just mentioned. This failing is principally *owing to their large proportion of pistillate, or imperfect, blooms.* To insure a good setting, it is necessary to interplant plots of La Marguerite with Edith or other equally good staminate variety for interpollination purposes. Bees will then do the necessary work. La Marguerite is also rather subject to the attacks of insect and fungus diseases.



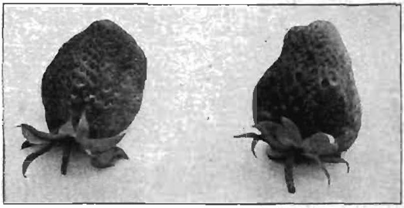


Fig. 3.—Different varieties of Strawberries.

Reading from left to right—Upper row: Melba, Sunbeam, Royal Sovereign. Lower row: Edith, La Marguerite.

The Edith is now rarely grown for its own sake, although the fruit is of excellent quality. It is generally cultivated for interpollination purposes. The plant is very prone to fungus diseases, and on that account, if not treated with effective fungicides, soon dies out.

Royal Sovereign, the leading standard variety of Great Britain, has proved anything but a success here. There is no fault to be found with the fruit, both as regards quality, color, and size when it can be got, but the trouble is to get it. So far as I know, wherever it has been planted in this country the result has been unsatisfactory. Its chief weaknesses seem to be a delicate constitution, great tendency to disease, and shy cropping. As it has only been introduced into Victoria during recent years, it is, perhaps, somewhat premature to uncompromisingly condemn it.

Other varieties, as Trollope Victoria and Captain, have for many years been grown in Victoria, but these are now fast giving place to the more profitable varieties, Melba and Sunbeam.

INTERPOLLINATION.

The necessity for the interchange of pollen between the blossoms of different varieties of the same species of plants is apparent to every fruit-grower if he be eager to obtain maximum returns. As with apples, pears, plums, &c., so with strawberries. It is found that some of the blooms of some varieties are not self-fertilizing, and, consequently, do not set for fruit. Such blooms are imperfect, and are called *pistillate*, because they contain pistils but no stamens; or, if stamens do exist, they are either too short to allow the pollen from the anthers to fall upon the pistils, or the anthers turn outwards towards the outer petals. In such cases self-fertilization is either impossible or very difficult. The defect can be remedied by interplanting such varieties with *staminate* varieties like Edith, Sunbeam, and Melba. Staminate, or perfect, blooms are those that contain both stamens and pistils (male and female organs) in a perfect form. They are self-fertilizing, and rarely fail to set for fruit. The pollen is carried from the staminate to the pistillate blooms

Fig. 4.—Blooms.
From left to right—Sunbeam (*staminate*), Melba (*staminate*), Edith (*staminate*), La Marguerite (*pistallate*).

by bees and other insects, and fertilization follows. In Fig. 4 the stamens, bearing on their extremities the anthers which contain the pollen, are plainly to be seen on the Sunbeam, Melba, and Edith blooms; while on the La Marguerite bloom the stamens and anthers are wanting.

PICKING AND PACKING THE FRUIT.

The fruit is picked into punnets or boxes when it is nearly ripe, irrespective of size. It is afterwards graded in the fruit-room into "Special," "1," and "2." Each picker has a shallow wooden tray made to hold four punnets. The punnets have a holding capacity of from 16 to 18 ounces. They are made of four very thin strips of kauri, two strips each way, and a narrow strip of the same wood round the top to bind the lot together. Their cost is about 22s. per thousand. They are made chiefly by the Beekeepers' Supply Company and A. Sturrock, Melbourne. The punnets are packed into crates holding 24, 32, or 40 punnets, according to size. Each layer of punnets is separated by movable shelves. The crates are known to the trade as twenty-fours, thirty-twos, and forties. One of each size is shown in the accompanying illustration. Some crates open down the side, but the one opening at the top, as here shown, is generally preferred.

The number of pickings is controlled by the weather. Generally speaking, every other day is sufficient, but if the weather should be very hot it may be necessary to pick every day.

FINANCIAL ASPECT.

Provided that all, or nearly all, the conditions I have outlined be observed, the profits accruing from strawberry growing will be large and certain. In favorable localities early crops can be obtained, which will readily realize in the open market 1s. 6d. per punnet. It will be some weeks before they fall below 1s. With regular and systematic cultivation, so as to conserve the moisture, in an ordinary summer there is no reason why the season should not extend till the first or second week in February. This is without irrigation. But by means of irrigation, judiciously practised, profits may be easily doubled. Mr. C. H. Laurissen, of Red Hill, already mentioned, has furnished me with the following figures in regard to his irrigated plot of 7 square chains:—

First picking, 29th October.
Last picking, 26th February.
Total yield for season, 4,600 punnets.

Fig. 5.—Picking Strawberries (Sunbeams), Mr. Cleine's, Red Hill, Victoria.

In the busiest part of the season Mr. Laurissen employs two pickers to assist himself and family. The family consists of one son and two daughters.

When all expenses have been deducted, it will be readily seen that there is a handsome profit. With the great and almost unlimited demand there exists for strawberries during the summer months, there is no reason why the present number of growers in Victoria should not be doubled or trebled. What one man can do, another with equal facilities and brains can also do. The culture of this delicious fruit is specially suited to families with small holdings. The men folk could do the necessary cultivation, and the women assist in the picking and do all the packing. It is well known that women are for more expert at

grading than men. It cannot be too forcibly impressed upon actual or prospective growers the very great importance of careful grading. Although the practice is now not too keenly observed, the time is not very far distant when the careful grader will score, and score heavily. In produce of all kinds—garden, dairy, or farm—this rule will equally apply.

PESTS, DISEASES, AND REMEDIES.

Amongst the insect pests affecting the strawberry the Strawberry Beetle (*Rhinaria perdix. Pascoe*) is one of the most destructive. The perfect insect is about ¼ inch in length, of a drab color, with black and white markings, and has the characteristic long snout peculiar to the weevil family. The larvæ are yellowish-white grubs about 1/5th inch

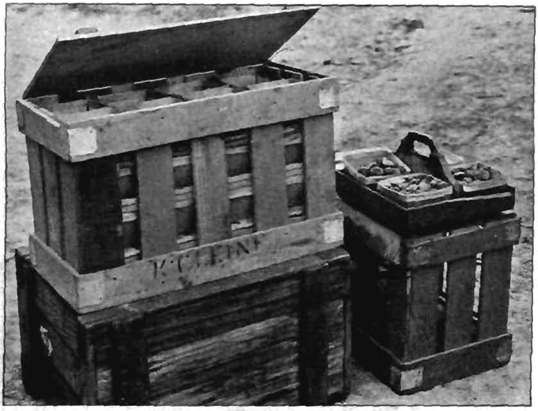


Fig. 6.—Strawberry Crates.
24's, 32's, and 40's.

long. The eggs are deposited by the female in the crown of the plant generally in the latter part of November or beginning of December, and hatch out about six weeks later. They first attack the crowns, often hollowing out a large hole, and thus destroying the vitality of the plants. They also tunnel through the leaf-stalks, and thereby destroy the leaves. The pupæ pass the winter in the soil close to the plants.

Owing to its appearance so late in the season, and the presence on the plants of much ripe fruit, it is difficult to attack the larvæ with an effective spray. Preventive measures may, however, be adopted by discontinuing the use of straw or grass as a mulch, this proving often a harbour for the pupæ. Early spring working with the cultivator between the rows will also dislodge many of them, and expose them to the attacks of birds. Sulphate of potash as a manure, recommended in

the paragraph on "Manuring," will also prove fatal to the pupæ, potash in all forms being peculiarly fatal to insect life in the soil.

FUNGUS DISEASES.

Chief among the fungus diseases affecting the strawberry is Mildew (*Sphærothrea humuli*). It appears generally rather late in the season. Some varieties are more subject to its attacks than others. La Marguerite, Edith, and Royal Sovereign are varieties with a tendency to the disease. Sunbeam is almost exempt, and Melba in a less degree. Preventive measures, such as effective drainage and the liberal application of lime, both sprinkled upon the leaves and applied to the soil, will be found to be beneficial. Spraying all plants just before the flowering period with Bordeaux mixture, 3.2.50 formula, or one-half the strength used on apple and pear trees for Black Spot, will prove effective in combating this and all other fungus diseases, including Leaf Spot (*Sphærella fragaria*).

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

(Continued from page 352.)

PART XIV.—CO-OPERATION IN THE DISTRIBUTION AND MARKETING OF FRUITS.

By E. Meeking, Senior Fruit Inspector.

At various times in this series of articles, such terms as "true co-operation," and "co-operation carried out under proper methods," have been used, and it has been hinted that the application of such methods provide the best means for placing our fruit industry on a sound footing. As these terms have been used without any indication of their meaning, it will be necessary to explain what is considered to be the chief essentials for success in co-operative production and marketing of fruit.

DEFINITION OF CO-OPERATION.

As the opinion is based upon the results obtained in the United States of America, Canada, and elsewhere, an outline of what has been achieved in those countries may be pertinent to the present remarks. In report No. 98, Mr. G. K. Holmes, of the United States Department of Agriculture, says:—"There is an intangible something that is demanded by co-operation as essential, and this is evidenced by feelings of fellowship, mutual devotion, and faithfulness. Co-operation does not exist enduringly without these." Although the altruistic principles indicated in these remarks are perhaps the most potent factor in making for co-operative success, yet something more than altruistic ideals alone are needed in the prospectus of any concern formed for the avowed purpose of obtaining material benefits for its members.

Although the principles underlying co-operation distinctly differ from those upon which an ordinary business concern is founded, and a departure is thereby necessitated between the methods in which a co-operative

society and other business establishments are managed, yet it must not be forgotten that the prospects of increased material benefit to members is also essential for success.

Co-operative societies must be prepared to hold their own from a profit-making stand-point in competition with outside business concerns; but, at the same time, members must not adopt the ethics of ordinary business life if success is to be achieved.

RESULTS OBTAINED IN OTHER COUNTRIES BY CO-OPERATION IN FRUIT-GROWING AND MARKETING.

A detailed description of co-operative principles, as applied to branches of agriculture other than fruit-growing, is beyond the province of these articles, and even so far as the fruit industry is concerned, material sufficient only to form a basis on which to frame opinions as to the methods considered necessary for applying the principles widely and successfully to the fruit industry of this State, can be given.

In order to assist in forming a judgment, a brief outline of the results which have been obtained in North America and other countries, as well as in this State, from the application of the co-operative principle to the fruit-growing industry, will be given.

CO-OPERATION IN CALIFORNIA.

The most widely-known association concerned in the matters of fruit distribution and sale on the North American continent is the Californian Citrus Fruit-growers' Exchange, which handles something like 75 per cent. of the entire citrus crop of California. The scope of its operations may be judged from the fact that this citrus crop now annually totals a gross value of $32,000,000 (nearly £7,000,000), and that it represents something like 6,000 growers. These growers are organized into about 100 locally incorporated associations, whose primary function is to prepare the fruit for market. These associations are combined and incorporated into thirteen district exchanges. Each of these exchanges, which in turn are incorporated into the Californian Fruit Exchange, selects a representative to act for it on the board of directors of the latter. This central exchange handles the fruit of the local exchanges after it is packed, places it in the different markets throughout the United States of America, and elsewhere, with the help and advice of the district exchanges, collects the proceeds of sales, and hands them over to the district exchanges, which, in turn, pay the growers through the local associations. All this is done without deducting any sums beyond the amounts required for working expenses. It is, in fact, a distributing agent who acts without charging commission.

The local associations usually own their own packing-houses, where the fruit is assembled and packed in grades, each grower losing his individuality, so far as the market is concerned. The associations are composed of the growers in each district, with a board of directors and officers for business management. The shipping season is divided into periods varying from two to six weeks in length, and these periods are known as "pools." The members of the associations are credited with the weight of each grade of fruit, and at the end of a "pool" are paid on a *pro ratâ* basis of the quantity delivered by each to the

central packing-house. The local associations act in an advisory capacity to the growers, and instruct them as to the quantity of fruit which each should deliver to the packing-house, and also as to the time of its delivery. The whole of this huge organization works like a piece of machinery, and the advantages which have accrued, both to the producer and consumer alike, have been enormous.

Prior to the formation of the district associations and central exchange, the citrus fruit industry of California had been almost ruined as a result of careless and disorganized methods of harvesting, grading, and disposal of the crop through speculative jobbers.

CO-OPERATION IN CANADA.

In Canada, the co-operative principle is also in practical operation, but the societies are more numerous, and the operations of each are, consequently, more limited than those of the Citrus Fruit-growers' Association of California. In the province of Ontario alone there are more than 30 associations in full swing. The members of all these associations are bound by penalties under the articles to sell their fruit through the association to which they belong.

CO-OPERATION IN THE NETHERLANDS.

The following extracts from a report on the methods adopted by co-operative societies in the Netherlands undertaking the disposal of fruit and market garden produce, by Messrs. W. H. Press and S. B. Meyer, who were specially commissioned in 1913 by the Organization Society of Great Britain to report on same, are given hereunder:—

In the Netherlands, there are about one hundred co-operative societies for the disposal of fruit and vegetables. Only market gardeners and fruit-growers can be members of these societies. The members elect a committee, consisting of a president, a vice-president, a secretary and two or four more members. An auction building is erected on a favorably situated piece of land, bought by the committee in the name of the society, and in this building the produce grown by members is sold by the committee, who are assisted by one or more officials, appointed and paid by them.

The sales are by "Dutch auction" and conducted by means of an automatic machine, which consists of a big clock-like dial, round the rim of which units of Dutch currency are marked. The merchants, or their representatives, are seated on raised seats, opposite this apparatus. Every seat has a number and communicates electrically with the dial by means of a button. Between these seats and the apparatus is a small canal, wide enough to admit the poling through of a barge. Every morning the growers gather the produce ready for market and after grading, packing, and weighing, record the quantity in a book. The produce is then loaded into a barge and a workman poles it to the auction place, where he hands the book into the office. From the moment the auction starts, the barges are poled through the small canal between the merchants' seats and the auction apparatus. The auctioneer announces the quantity, and samples are passed among the buyers. The pointer is then released, starting at a figure on the rim of the dial, which indicates a higher price than the produce is normally worth. The pointer swings round, indicating lower and lower prices, and when the price that a merchant is prepared to give is reached, he presses the button below his seat, which checks the pointer and indicates the price at which the produce is sold. At the same time his number appears on an indicator, and as at each sale the same seats are allotted to the buyers, the work of recording the purchasers is simplified.

The amount fetched for the produce is then entered in the grower's book, and when the barge is being poled out, the book is returned to the grower's representative. On his return the grower can thus see what price his produce has made in the market.

Produce is not sold on a mutual basis, each market gardener receiving exactly the amount realized by his produce, less a certain percentage, which is retained by

the committee to meet the necessary working expenses, and the growers' accounts are settled weekly. On the other-hand, previously prevailing evils, such as depression of prices by buyers, underweight and bad quality, and bad grading of goods on the part of the growers, no longer occur.

All produce must be paid for before it can be taken from the society's premises, and deposits for any empties must be made to the full extent of their value.

. . . .

Alongside many of the waterways are sheds erected by the society for the use of which buyers pay a nominal rent, and in which they pack the produce to be sent to distant markets, including those of Belgium, Germany, and England.

The societies in Holland lay down stringent regulations for grading and packing. If before the sale the produce is found to be not up to the standard, the controller refuses to allow it to pass through the auction until it has been regraded or repacked. If after purchase any produce is found to be not of the declared standard, the buyer has the right to refuse it; a defaulting member being fined 20 per cent. of the value for which it has been sold; 10 per cent. of this goes to the merchant and 10 per cent. to the funds of the society.

. . . .

We found that the prosperous condition of Dutch growers is undoubtedly due to their energy, adaptability, industry, and thrift, and their belief in the principles of co-operation.

That the system of co-operation in the marketing of fruit and market produce in Holland has largely reduced the commissions and charges formerly paid to middlemen, and that it has served to standardize the quality of Dutch produce.

That *these methods of sale have prevented the undercutting of prices that arise when individual growers compete against each other in the same market.*

That the general system of buyers paying cash, or having a deposit account on which a society can draw, obviates all possibilities of bad debts.

That the enforcement of a high standard of grading and packing has made it difficult for an individual to practice "topping" or the giving of short weight.

(*To be continued.*)

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914.

MONTHLY REPORT ENDING 14th JUNE, 1914.

The second monthly report of the above competition is as follows:—

The weather during the past month has been unfavorable for egg production. Rain fell on several days with cold and bleak winds. Several of the birds are moulting, both in dry and wet mash classes, which accounts for the pens being backward in egg production; they are, however, improving now, and the general health is good. The birds are bright and vigorous and doing well.

Light Breeds, Wet Mash.—The leading pen (J. H. Gill, pen 25) has now a total of 280 eggs, whilst (J. J. West, pen 9) and (E. A. Lawson, pen 36) are equal with 265 eggs to their credit.

Light Breeds, Dry Mash.—E. A. Lawson, pen 55, is leading with a total of 240 eggs. W. M. O'Mullane, pen 60, is second, with a total of 230 eggs; the third (C. Lawson, pen 53) has 228 eggs to its credit.

Heavy Breeds, Wet Mash.—The leading pen (J. McAllan, pen 77) has a total of 240 eggs, with (D. Fisher, pen 81) second, with a total of 227 eggs. The third (J. H. Wright, pen 82) has 211 eggs to its credit.

Heavy Breeds, Dry Mash.—D. Fisher, pen 100, is leading with a total of 214 eggs; A. Greenhalgh, pen 98, is second, with a total of 205 eggs; the third (T. W. Coto, pen 94) has 204 eggs to its credit.

The output of eggs for the month was 8,062, as compared with 6,362 eggs last month.

The food was similar to last month; for the dry mash, meat and green food are given separately at noon.

The rainfall for the month, 104 points.

FOURTH EGG-LAYING COMPETITION, 1914-1915.

Commencing 15th April, 1914.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen.	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th May.	15th May to 14th June.	Total to date 2 months.	
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns ..	J. H. Gill	130	150	280	1
9	" ..	J. J. West	150	115	265	2
36	" ..	E. A. Lawson	137	128	265	
26	" ..	Mrs. H. Stevenson .	112	145	257	4
10	" ..	R. Hay	122	127	249	5
45	" ..	H. C. Brock	119	119	238	6
3	" ..	T. A. Pettigrove ..	117	113	230	7
17	" ..	F. Doldisen .. .	112	117	229	8
37	" ..	*S. Brown*	97	126	223	9
19	" ..	Marville Poultry Farm ..	115	100	215	10
16	" ..	A. R. Simon .. .	115	100	215	
44	" ..	*A. Ross*	99	108	207	12
40	" ..	J. Schwabb	75	127	202	13
4	" ..	Giddy and Son .. .	85	110	195	14
35	" ..	W. Tatterson	*90*	*102*	*192*	15
11	" .	C. J. Jackson	91	98	189	16
29	" ..	V. Little	65	121	186	17
12	" ..	A. H. Mould	76	109	185	18
33	" .	W. G. Osborne	85	99	184	19
23	" ..	S. Buscumb	99	80	179	20
28	" ..	Utility Poultry Farm ..	68	111	179	
34	" ..	W. A. Rennie	60	108	168	22
22	" ..	B. Mitchell	85	80	165	23
1	" ..	F. G. O'Bree	78	85	163	24
24	" ..	C. Pyke	77	82	159	25
31	" ..	E. H. Bridge	77	69	146	26
47	" ..	W. G. Swift	50	90	140	27
13	" ..	H. Hanbury	43	97	140	
2	" ..	*J. C. Armstrong* .	76	61	137	29
30	" ..	G. W. Robbins .. .	54	82	136	30
6	" ..	C. R. Jones	68	65	133	31
18	" ..	*All-lay Poultry Farm* ..	*66*	*63*	*129*	32
8	" ..	F. W. Brine	53	74	127	33
38	" ..	G. Hayman	48	79	127	
42	" ..	E. W. Hippe	64	*62*	*126*	35
48	" ..	Bennett and Chapman ..	23	101	124	36
15	" ..	E. Waldon	31	92	123	37
49	" ..	A. Beer	68	52	120	38
32	" ..	Gleadell Bros.	24	85	109	39
20	" ..	A. W. Hall	36	68	104	40
21	" ..	R. A. Lewis	45	50	95	41
43	" ..	G. Mayberry	32	46	78	42
39	" ..	R. L. Appleford ..	42	33	75	43
41	" ..	Doncaster Poultry Farm	32	40	72	44
46	" ..	C. L. Sharman	44	26	70	45
7	" ..	B. Cohen	34	23	57	46
50	" ..	F. W. Silbereisen ..	27	25	52	47
14	" ..	F. C. Western	..	51	51	48
5	" ..	*A. Mowatt*	26	20	46	49
27	" ..	Walter M. Bayles ..	3	42	45	50
		Total	3,525	4,256	7,781	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915—*continued.*

Pen.	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th May.	15th May to 14th June.	Total to date 2 months.	
			LIGHT BREEDS—*continued*.			
			DRY MASH.			
55	White Leghorns ..	E. A. Lawson	89	151	240	1
60	" ..	W. M. O'Mullane ..	114	116	230	2
53	" ..	C. Lawson	107	121	228	3
58	" ..	Miss L. Stewart	112	107	219	4
51	" ..	Moritz Bros.	55	140	195	5
68	" ..	E. W. Hippe	78	107	185	6
65	" ..	W. G. Osborne	58	126	184	7
62	" ..	A. Greenhalgh	59	102	161	8
69	" ..	C. J. Beatty	76	64	140	9
57	" ..	J. Jackson	50	85	135	10
64	" ..	E. A. Carne	71	51	122	11
63	" ..	Hanslow Bros.	20	96	116	12
61	" ..	H. Hanbury	40	70	110	13
59	" ..	F. G. Silbereisen ..	72	30	102	14
70	" ..	W. H. Robbins ..	24	45	69	15
67	" ..	Walter M. Bayles ..	21	45	66	16
52	" ..	Myola Poultry Farm ..	28	33	61	17
54	" ..	G. Carter	2	52	54	18
66	" ..	S. Brown	22	6	28	19
56	" ..	R. C. Buchan	5	14	19	20
		Total	1,103	1,561	2,664	
			HEAVY BREEDS.			
			WET MASH.			
77	Black Orpingtons ..	J. McAllan	115	125	240	1
81	" ..	*D. Fisher*	*120*	*107*	*227*	2
71	" ..	J. Ogden	89	125	214	3
82	" ..	J. H. Wright	103	108	211	4
88	" ..	H. H. Pump	71	135	206	5
84	Rhode Island Reds	J. Mulgrove	108	95	203	6
78	Red Sussex ..	Jorgen Anderson ..	99	70	169	7
72	Black Orpingtons ..	T. W. Coto	72	88	160	8
75	" ..	Fairdeal Poultry Farm ..	65	93	158	9
74	" ..	S. Brown	57	90	147	10
89	" ..	Marville Poultry Farm ..	52	91	143	11
83	" ..	Cowan Bros.	37	105	142	12
76	" ..	W. P. Eckermann ..	58	83	141	13
73	" ..	J. A. McKinnon ..	62	56	118	14
87	" ..	A. Douglas	83	34	117	15
86	Buff Wyandottes ..	W. G. Swift	33	53	86	16
85	Golden Wyandottes	J. C. Mickleburg ..	19	59	78	17
80	White Plyth. Rocks	Stranks Bros.	1	18	19	18
79	Barred Plyth. Rocks	Bennett and Chapman ..	..	16	16	19
		Total	1,244	1,551	2,795	
			DRY MASH.			
100	Black Orpingtons ..	*D. Fisher*	*123*	*91*	*214*	1
98	" ..	A. Greenhalgh	85	120	205	2
94	" ..	T. W. Coto	113	91	204	3
97	" ..	J. McAllan	39	100	139	4
91	" ..	C. E. Graham	51	40	100	5
92	" ..	Fairdeal Poultry Farm ..	46	34	80	6
90	" ..	J. H. Wright	18	52	70	7
96	*Rhode Island Reds*	*Myola Poultry Farm* ..	*11*	*18*	*20*	*8*
95	White Plyth. Rocks	C. L. Hewitt	..	18	18	9
93	Black Orpingtons ..	Myola Poultry Farm ..	4	12	16	10
99	White Plyth. Rocks	Mrs. G. R. Bald ..	..	9	9	11
		Total	490	694	1,184	

A. HART,
Chief Poultry Expert.

Department of Agriculture,

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer; if the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often, surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or in excess when it is in the soil, and not before it enters the soil. Two circumstances, and two only, permit of surface drainage; first, when it is necessary to carry away excessive storm-water; and, second, when it is practically impossible to find an outlet for the under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface drainage is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited, indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. Where natural drainage occurs, the orchardist is fortunate; but, whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their time of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results; they are also less liable to silting up than any of the other materials.

Drains should be placed into the clay, if this be not too deep; in any case, they should be below any possible interference from cultivating instruments.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growth and a good frame; but as the tree advances in age, the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths; crowded and overlapping laterals should be shortened back; fruit bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

SPRAYING.

Spraying should be carried out on the lines indicated in last month's notes, and it should be completed by the end of the month.

Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, pease, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

Flower Garden.

Deciduous shrubs and roses may now be planted out; their situations should be well drained, and all manure should be well incorporated with the soil.

Among the more modern roses, is the type which is now known as "Pernetiana." This class of rose was raised by Pernet-Ducher of Lyons in France, and includes some roses of remarkable colouring. Pernet-Ducher used the well known Persian yellow rose in crossing, as a means of getting newer yellow and orange shades into his roses. The first result was "Soleil d'Or," which was a rose of remarkable colouring, possessing mainly shades of nasturtium red and orange. Unfortunately this rose is not very free flowering. The class is readily distinguished by the very numerous thorns, and the dark green shining foliage. The rose of this class which is best known, is the Lyons rose, having flowers of good form and substance, of a coral red colour with yellow at the base of the petals. It has the unfortunate habit of dropping its foliage at times, but even so it is a desirable rose for show and garden purposes. The best yellow of this class is "Rayon d'Or, which is of deep golden colour. It is not a show rose, but it is striking for garden work, the combinations of colour in the rose and foliage, being very effective. Other good roses of this section are:—

"Arthur R. Goodwin," rich salmon pink, with copper and orange shades.

"Viscountess Enfield," a good rose coloured bloom, with apricot shadings.

"Juliet," a hardy variety, with bright carmine red petals, the outside being old gold; and

"Madame Edouard Herriot," This last mentioned rose is a remarkable one, and appears to be doing well in Australia. The flowers are of a rich flame red, shaded with terra cotta, and, being carried on long stems, make it a very desirable variety for any garden.

All shrubs that produce flowers on their young growths, including roses should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood, and those that flower on the wood of past season's growth. Those that flower on the new wood, and may be pruned now, are Lasiandra, Lantana, Cestrum, Hydrangea, Tecoma, Plumbago, Erythrina (some species), &c.; and those that should not be touched at present are: Spiraea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus Pissardi, P. mumé, Deutzia, Ceanothus, Polygala, &c. It is a safe rule, in pruning shrubs, to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged and untidy appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum should be cut back; and, if necessary, lifted and heeled in a temporary location for the winter.

Plant out Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed in the day-time when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Calves should be kept in warm, dry shed. Those on the bucket should be given their milk warm. The bull may now run with the cows.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and the feeding troughs clean and wholesome. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run.

SHEEP.—Market all fat aged ewes while prices are high, and replace with good young half bred, or roomy merino ewes. Wherever possible, lamb-raisers should club together and obtain these first hand from breeding stations. Retain a proportion of early born, bulky-fleeced, shapely ewe lambs. These in their turn lamb big percentages of best lambs, and cut big fleeces. Market any early-born wether lambs ready. Cull stud breeding ewes carefully, and retain only the very best; pedigree alone is not sufficient. Ascertain rams required for coming season, and apply to breeders this month.

POULTRY.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule or thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

CULTIVATION.

FARM.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

ORCHARD.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur spray.

FLOWER GARDEN.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

VEGETABLE GARDEN.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply 1st acid iron sulphate treatment (see *Journal* for July, 1911). Apply readily soluble nitrogenous manures (soda nitrate or ammonium sulphate) during this month.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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RUTHERGLEN EXPERIMENT FARM.

IV.

WHEAT GROWN IN ROTATION WITH FORAGE CROPS.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Wheat may be grown (*a*) continuously on the same land; (*b*) alternately with bare fallow; (*c*) in rotation with cereal crops and pasture; and (*d*) in regular rotation with forages and cereal crops. The profits to be made from each of these methods of growing wheat will depend on the rainfall, the nature of the soil, the labour conditions on the farm, and the markets. In some cases, where share-farming is a common practice, and certainly in the more favoured districts of the State, continuous cropping with wheat is by no means uncommon. Here the tenant may hold the lease for a short period, and he deliberately adopts continuous cropping in the hope of extracting from the soil the utmost total produce during his temporary period of tenure. Continuous cropping is also very common in newly-settled Mallee areas, where the main object of the settler during the pioneer period is to suppress the Mallee shoots. In other cases, where little or no stock are kept, and in districts of uncertain rainfall a two-course rotation of wheat and bare fallow is often practised. While this system, especially in a dry district, makes for heavy crops, yet it does so at the expense of the fertility of the soil. This is a serious drawback, for nothing can be more certain than that a continuance of such a policy would ultimately result in depleted soil fertility, and the lessening to danger point of the somewhat limited reserves of organic matter in the soil. Continuous cropping with wheat, and the biennial system of fallow and wheat, preclude a farmer from keeping live stock in any numbers on his farm, and from counteracting the inevitable loss of organic matter inseparable from such methods of cropping. Such methods of cropping may be justified as temporary expedients, but they must never be allowed to feature as permanent methods of farming.

There are very few wheat farms in the settled districts in which wheat growing is not associated with sheep farming. High prices for wool and an assured market for fat lambs has now led to the close association of wheat-growing with sheep-farming, to the mutual advantage of both. The recent rise in the price of meat, and the prospect of a continuance of high prices due to the world-wide shortage of supplies, will serve to make this partnership of wheat and sheep growing even closer. The introduction of sheep on a wheat farm implies the provision of an area for grazing, which in turn implies some system of rotation. In the Mallee and the Northern districts the rotation is very simple. It comprises a three-course rotation of wheat, grass, bare-fallow. In the Wimmera this rotation is extended to a four-course system, namely, wheat, oats, grass, bare-fallow. Under each of these rotations the sheep grazed on the grass, the fallows, and the wheat and oat stubbles, the labour bill is reduced to a minimum, and a good crop of wheat is ensured, because it is sown on well-prepared fallow. It must be obvious, however,

Wheat grown in rotation with Rape, Rutherglen Experiment Farm.

that such rotations can be practised with advantage only where land values are relatively low, and in districts of moderate to scanty rainfall. With high land values, and in districts of good rainfall bare-fallowing is less necessary, and it should, if possible, be eliminated from the rotation. There is an area of 29,317 square miles in Victoria enjoying a rainfall of 20-30 inches, and on land of this character the wasteful bare-fallow could and should be substituted by some profitable crop. Now that the meat market has taken a decided turn for the better, and as we have every reason to believe that the improvement is likely to be fairly permanent, it is certain that the growing of special forages for feeding to sheep will become a feature of the future practice in these areas.

The growing of special forage crops for feeding off by sheep certainly means breaking away from the hallowed traditions of the Australian

pastoralist. But what was true as regards sheep-farming in a pastoral country when holdings were large, sheep cheap, and population scanty, does not hold true in a State like Victoria, which is approaching the intense culture stage. And if the practice of growing special forages for feeding off with sheep becomes fairly general, and a regular feature of our agriculture, we in Victoria will only be following in the wake of those agricultural countries of the world where economic pressure has demanded the greatest possible utilization of the soil's resources. The growing of forages for feeding to stock will naturally be confined in the first instance to the better watered districts of the State, for here they may be expected to give from the outset returns that will directly encourage their regular production. Subsequently, and especially if prices for live stock continue to rise, it may be confidently anticipated that systematic forage growing will extend into those drier areas, where wheat and oats are practically the only crops now grown.

The advantage of such a change in our agricultural practice will be readily apparent. From the national point of view such a practice leads to conservation of natural resources. The growing of forage crops and the keeping of large numbers of live stock on the farm makes for increased soil fertility, and thus satisfies the first requirement of all permanent systems of agriculture. Moreover, such a system would enable far more live stock to be kept on a given area, since cultivation supplies more food material per acre than does grazing; diversity in farm production would relieve the present monotony of wheat, and fallow; and continuity of farm employment would be provided throughout the year. From the point of view of the individual farmer such practice would lead to increased gross returns and net profits per acre, and the soil fertility would be enhanced as year succeeds year.

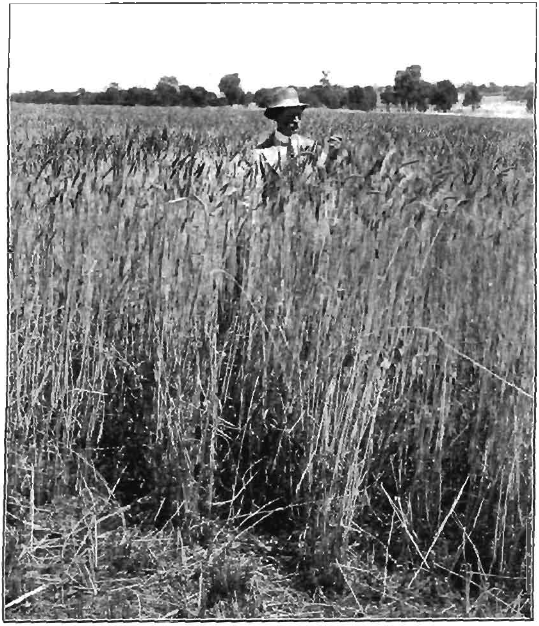
In order to secure definite information as to the effect of forage crops on succeeding wheat crops, a set of plots were marked out two years ago at Rutherglen. In 1912, forages were grown on five different plots, fed off with sheep, one plot was sown to wheat, and one plot was kept in fallow. In 1913 the whole seven plots were sown with wheat, and comparisons were thus obtained as to the value of the wheat crop grown (*a*) after wheat, (*b*) after bare-fallow, and (*c*) after forages fed off. The results are given in Table I.:—

TABLE I.

WHEAT GROWN IN ROTATION WITH FORAGES FED OFF (Rutherglen Experiment Farm).

Plot.	Treatment.	Increase in Live Weight of Sheep per Acre.	Value of 1912 Crop (Increase in Live Weight=1½d. per lb.	Wheat *Crop 1913.*	Value of 1913 Crop at 3s. 4d. per bushel.	Gross Returns for two years.
		lbs.	£ s. d.	Bush. lbs.	£ s. d.	£ s. d.
1	Rape, 1912; wheat, 1913 ..	722	4 10 3	28 44	4 15 9	9 6 0
2	Barley, 1912; wheat, 1913	658	4 2 3	26 8	4 7 1	8 9 4
3	Pease, 1912; wheat, 1913 ..	312	1 19 0	19 22	3 4 7	5 6 4
4	Rye and vetches, 1912; wheat, 1913	480	3 0 0	22 58	3 16 7	6 16 7
5	Beerseem, 1912; wheat, 1913	210	1 6 3	21 56	3 13 1	4 19 4
6	Bare fallow, 1912; wheat, 1913	..	..	29 58	4 19 10	4 19 10
7	Wheat, 1912; wheat, 1913 ..	*Bush. lbs.* 13 6	2 3 10	14 0	2 6 8	4 10 6

Whilst it is not wise to draw deductions too hastily, it would appear from the data already obtained that in districts similarly situated to Rutherglen, enjoying a rainfall of 20 inches or over, the practice of growing forage crops for feeding off with sheep would yield higher gross returns and probably much higher net returns per acre than either bare fallow or continuous cropping with wheat. It is certain, however, that the number of sheep kept on any farm could be considerably increased by the growing of forages.



Federation Wheat, Rutherglen Experiment Farm, 1913.

A further point of interest is that, even at Rutherglen, the bare-fallow plot yielded 2 bushels 54 pounds more wheat than the two crops where wheat was made to follow wheat. The net profit in the former case was, of course, considerably greater than where wheat followed wheat, since only one set of seeding and harvesting operations were required, and only one lot of manure and seed. The highest returns were

obtained from wheat after barley and wheat after rape. Thus the gross return for the two years from Plot 1 (wheat after rape) was £9 6s. per acre; Plot 2 (wheat after barley), £8 9s. 4d.; Plot 4 (wheat after rye and vetches), £6 16s. 7d.; as against wheat after bare-fallow, £4 19s. 10d.; and wheat after wheat, £4 10s. 6d. The returns from the rye and vetches plot would probably have shown up to much greater advantage had this forage been fed down earlier in the season. The growth of beerseem was very unsatisfactory. With respect to the grazing returns for the forage crops, for reasons set out in detail in a previous article, the value of the crop was measured by the increase in live weight in the sheep per acre. While such a method of estimation has its limitations, it is probably the most satisfactory that could be applied in comparative tests of this type.

The results from the peas plot do not do that crop full justice. Up till harvest the wheat, after peas, was by far the most promising crop of all. The growth was so rank that the crop lodged badly with the heavy winds, and ultimately only 19 bushels 22 lbs. of grain per acre were obtained. A duplicate plot of Federation wheat after peas was cut for hay, and yielded 2 tons 14¾ cwt. per acre.

(To be continued.)

THE LARGE WHITE PIG.

It is difficult to believe that the now famous white pigs which, represented by the large variety, are found all over the world, were the creation of a Yorkshire weaver but little more than 60 years ago. Still more difficult is it to recognise that before its appearance at the Royal in 1851 there was practically no British breed of pigs at all. It is true that there were types which were found in different countries, like the early Berkshires; but in the modern sense of the word there was no standard, and the pig population was but emerging from a state of barbarity; their ancestors of 50 years before having been to a large extent kept in droves and allowed to run wild. There were white pigs of great size in the North which were slow in growth, long in body, head and legs, flat in the side, coarse in the hair, full of activity, prolific and hardy, but poor producers of meat, which was too lean, and when ready to kill wanting in that tenderness which characterizes the pork and bacon of to-day, produced as it is from rapidly-growing and quick-fattening pigs of a third of their age.

From what source Tuley, the Keighley weaver, obtained the blood which he infused into the large pigs of the North will perhaps never be known, but it can only be supposed that he was fortunate enough to find suitable material in some of the crosses which has been made with the Chinese, an imported pig, which had so much to do with the improvement of the smaller pigs of the South, and which were later on so common in Berkshire and Dorset. When the first Large Whites appeared they created the greatest sensation ever known in the pig breeding world. The breeder built a new house for himself out of the proceeds of one litter of pigs, for prices which have seldom since been realized were paid by some who established new herds.

There is little doubt that as the Large Whites have improved the pigs of America, Germany, and other portions of the European Continent, and as they have been the prominent factor in the production of the hams and bacon which Denmark supplies in such enormous quantities to Great Britain, so have they been used for the improvement of our other native breeds, whether of white, black, or sandy skin. If they have succumbed of recent years to the Large Blacks and Lincolns in weight, they still maintain superiority over all competitors in form and general quality, while they are large enough for any practical purpose. Great weight is not a meritorious property unless it is allied with youth. The fact that a large white sow has sometimes reached a weight of 1,200 lb. to 1,250 lb. after rearing numerous litters is evidence of what can be done, but there is no desire on the part of the public either for large joints, excessively fat, or for tough meat, which, of necessity, results from age. The great merits of the Large Whites are found in the rapid growth of the young and their fitness for bacon or pork at an age which would have astonished our forefathers; that they are adapted for crossing upon almost all types of pig, for the improvement of the common swine of the country, and for producing the best class of meat, not necessarily at the least possible cost.

Characteristics.

The Large Whites are hardy, vigorous and prolific breeders; the dams are good mothers, better tempered than their unimproved ancestors, useful grazers, and full of vitality; but it does not follow that every pig in a litter is fit for sale or use for reproduction. One of the most important facts which should be recognised is that, however costly the stock, the majority of the produce is only fit for the butcher, and that only the largest, the strongest, and the most perfect in form, should be used for breeding. More harm has been done to the industry and the reputation of the breed by the sale of worthless pigs, which had but the one merit of being purebred, than from any other cause, and it is this fact which explains the smallness of the size, and the general inferiority of the great majority of the pigs of this variety, especially those which we have seen in foreign countries. In selecting stock of this variety, the breeder should make a point of insisting on symmetry in the boar, and size and roominess in the sow. A small sow cannot breed pigs of the largest type, but she should have twelve teats and be a known producer of plenty of milk, or a daughter of a good milking dam. Without this property her litters cannot be reared. The points of the Large Whites are concerned with its size, form, quality, head and hair. In all the white York varieties the head is characteristic, varying from extreme shortness with a turned-up snout of the small breed, to the comparative lengthy head, slightly dished face, and straighter snout of the large. The forehead is broad, the ears somewhat narrow, well fringed with hair, and sloping almost horizontally forward. Looked at from the side, the back is straight and broad from the root of the tail to the shoulder; there is then a gentle slope to the head, with a fairly long neck, unlike the short thick collar of the Middle and Small breeds, and thus producing less of the wasteful meat on the fore-end of the flitch. The loin is broad and strong, the ribs nicely sprung, the sides full, reaching down to a full belly, which should provide abundance of

well-streaked meat. From the back of the loin to the hocks the body curves symmetrically, showing a full, thick, deep ham, furnished down to the joint, while the legs are strong, well set on the outside of the carcase, straight and short. The tail is long, well-tasselled and fine, while the hair should be long, silky, and plentiful. Some strains are very short of hair, and always look like crossbred pigs in consequence. The skin must be thin and a clear white, black or blue patches or spots being no longer admissible.—Jas. Long.

THE WALNUT.

(Juglans regia.)

By C. F. Cole, Orchard Supervisor.

Origin.

The common edible walnut of this and other States of Australia, and known as the English walnut, is probably indigenous to Greece and parts of Asia.

From Greece it was carried into Italy by the Romans. Thence it was carried and cultivated throughout all the countries of Southern and

Fig. 1.—Walnut Tree, back yard, Bright.
Height, 50 ft.; diameter, 60 ft.; bole, 7 ft. 10 in.; 45 years old.

Western Europe, its fruit being highly prized as an edible nut and a nutritious article of food.

Somewhere about fifty years ago it was first introduced and cultivated in Victoria, more as an ornamental than a highly-profitable tree.

REMARKS.

In many of the old gold mining towns, such as Bright, Wandiligong, &c., there are to be seen growing and thriving some of the finest specimens in the State; such trees have been raised from nuts planted by miners and other persons living in and close to these towns.

Under favorable conditions the walnut is thrifty, makes rapid growth, and is long-lived. With very little trouble it becomes an attractive and ornamental tree, tall, with wide, spreading branches.

In many of our rural districts suitable to its growth it is a pity that it is not more widely planted, for, besides being a fine shade tree during the summer months, the nuts, when properly handled and graded, have a ready sale at a very remunerative figure.

It is a common sight when travelling through districts where it grows to see selected land cleared of all native timber and no steps taken to replant any species of tree. Even around the homestead trees are not planted either to beautify, shade from the summer's heat, or protect it from high winds. Such conditions apply to the hot as well as the cooler districts. The walnut being a deciduous tree, *i.e.*, shedding its foliage during winter, affords shade during the warm weather, and permits the sunlight to get through during the cold months. Hence it is of value apart from its fruit, where soil conditions are favorable to its growth. Besides orchardists and others, farmers could grow this tree to advantage by planting it along their boundaries and other convenient spots, not only beautifying their estates, but affording shade to their stock. The droppings from the sheltering stock would enrich the soil beneath and about the trees, and thus maintain a good, healthy growth and prolificacy of nut production. Walnut culture up to the present in this State has not been taken up on anything like sound commercial lines, probably the chief reason being attributable to there being no immediate returns. The trees usually take, under general conditions, from eight to ten years before coming into bearing. It is not an uncommon occurrence, however, to see trees under particularly favorable circumstances producing a few nuts from four to eight years of age. Under present conditions the planter can expect only a very low return from the eighth to the twelfth or thirteenth year. Messrs. Walsh and Sons, orchardists, of Tallangatta, give the following returns, marketed from a thirteen-year-old tree, season 1913, viz., 135 lbs. weight of nuts, which gave a net return of 7d. per lb., or £3 18s. 9d.; variety, Dwarf Prolific Seedling. To the capitalist or those owning suitable land with other means of livelihood, walnut planting under certain conditions is a safe proposition.

Whilst inspecting most of the walnut trees and groves in the North-East of this State, it was a common occurrence for the writer to be informed of large sums of money having been made from individual trees, at one harvest as high as £15 value of nuts having been marketed. Such trees practically grow wild, and receive no cultivation or attention whatever. The prices obtained vary from 7d. to 9d. per lb., according to grade and quality. To show that there exists a ready demand for this highly-esteemed nut, the quantity imported into this State from 1st January, 1913, to 31st December, 1913, was 1,548 packages, averaging 1½ cwt. per package, or, approximately, 116 tons 2 cwt.; at the lower price of 7d. per lb. this gives a total value of £7,585 4s.

The English walnut (*Juglans regia*) constitutes one of the most important and attractive tree crops of Southern California, taking second place to the orange in prominence, the area under walnut trees in 1912 comprising more than 30,000 acres. Up to the present time the production of walnuts in Victoria can hardly be termed an industry; the majority of small groves that have been planted have been simply left uncultivated, and the area treated as if growing native or other timber. The general impression prevails that the walnut after planting requires no further attention. This idea is an erroneous one. Although no unusual skill is required to conduct a well-established grove, the trees,

Fig. 2.—Five years old Walnut Tree.
Height, 20 ft.; diameter, 18 ft.; bole, 2 ft. 8 in.

if they are to be grown for profitable nut production, require a certain amount of care and attention.

It may be contended that this is not the case, since there are so many fine examples of trees in different districts that have received no attention or care since planting. This is granted, as illustration (1), being a good example, shows. But it should be understood that these isolated specimens of trees are growing under absolutely the best conditions as regards climate, soil, moisture, drainage, and position, such conditions being conducive to vigorous growth, nut production, and longevity. The superiority of such fine trees is also largely due to being isolated from

other trees, thus receiving full exposure to the light and air, which is an essential factor in walnut cultivation. Perfect conditions as regards uniform moisture is not general in this State, either where the walnut is found thriving or in localities where the annual rainfall is limited and the summer months long and dry. Systematic cultivation, which conserves moisture, is just as beneficial and profitable in an area of walnuts as with apples, pears, &c.

Illustration (2) depicts a five-year-old walnut tree grown from a nut planted by a Mrs. Duncan, of Bright. The site upon which this tree is growing was a hole some 8 feet in depth, made by miners. This hole was refilled with soil, stable manure, &c. The drainage system is perfect, owing to the natural formation, and the moisture which is essential to the walnut is supplied to this well-developed young tree by a drain from the house, which carries away superfluous waters.

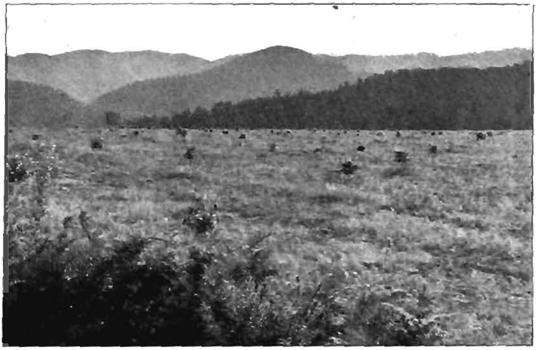


Fig. 3.—View showing portion of the Wandiligong Nut Grove.

It is such examples that give guidance to localities, positions, and to conditions of soils most suited to the cultivation of the walnut upon commercial lines.

In the Upper Wandiligong Valley there is a large walnut grove of 100 acres, planted by a syndicate known as the Wandiligong Nut Grove Proprietary Company. Already 60 acres have been planted, and the young trees are making good progress. This land, besides being suitable for walnut culture, should prove to be fair land for potato production. It is the above syndicate's intention to utilize the land between the rows of young trees for the production of crops that can be profitably grown in this district, the distance apart of the trees in the rows allowing this without causing injury to the growth of the trees.

After the trees have reached certain dimensions probably the whole area will be sown down with a suitable grass and sheep grazed. The

constant tilling and manuring between the rows will not alone benefit the young trees by giving them a good start, which is essential, but greatly improve the physical, as well as the chemical, conditions of the soil, which ultimately will be the means of establishing good grass land.

To plant a grove with the object in view of grazing when the trees have obtained such a height that stock cannot injure them, should only be practised where the soil is deep, well-drained, and of a fairly heavy nature, with an abundance of moisture. If this method is adopted cultivation should not cease; during the summer months the soil beneath and about the trees should be kept well tilled.

A common practice in California after planting a grove of walnuts is to interplant with some other tree or crop, in order to get a return off the land whilst the walnuts are coming into bearing. Fortunately, owing to the walnut being a deep rooting tree, no injurious effects from judicious interplanting will result. In many of the localities in this

Fig. 4.—View of the Upper Wandiligong Valley suited to Walnut Culture.

State where the walnut thrives, and the soil conditions are favorable, this system of interplanting with many kinds of large as well as small fruits could be carried out with advantage.

During recent years the Californians have been paying great attention to the improvement of the walnut, owing to the growing importance of the industry. Several experimental farms are raising the most important varieties, and great care is being paid to different root stocks, to prove or disprove their suitability in various soils and climates.

Conditions prevailing at the present time in Victoria do not permit walnut-growers getting the greatest returns from the trees. In those moist districts most suited to production, the industry is seriously marred by a disease commonly termed walnut blight, and black spot, but scientifically known as bacteriosis of the walnut. This bacterial disease, besides attacking at different periods the young fruit, also causes in the

spring serious injury to the foliage and shoots of the young and growing trees. During some seasons in localities where climate conditions are most favorable to the development and spread of this disease, fully 75 per cent. of the maturing nuts upon trees are destroyed.

Great losses were occasioned at one time by this disease (*Bacteriosis*) in California, and the Walnut-growers' Association of that place offered a standing reward of $20,000 for a feasible remedy.—(*Bulletin No.* 231. Berkeley, California.)

The conditions existing in Victoria at the present time existed at one time in America, but after many years of careful selection, and the introduction of certain French varieties far superior to the old English hard-shell types, and the perpetuation of selected seedlings immune, or almost so, from bacteriosis, has built up the walnut industry in America upon good, sound commercial lines, and now it is one of the most profitable occupations in those States suitable to its growth. This has also

Fig. 5.—Maturing Walnuts, sunburnt, natural size.

been accomplished by grafting methods and the heading over of old seedling trees with varieties not prone to this disease. From trees examined by the writer, and from information gathered during this past season, many trees growing in districts where the bacteriosis is very prevalent are also, to a large extent, free from this disease. Individual seedling trees of very prolific kinds are also to be seen producing a superior nut of far higher quality than the average, and also less liable to the attack of bacteriosis. Yet the planting of the walnut in the past has been haphazard, and trees are raised from nuts obtained from trees of good, bad, or indifferent types.

If the walnut is to be grown in this State profitably in the future, it will be absolutely necessary to secure the best varieties from local types, or, better still, import from overseas early maturing, prolific varieties of

high marketable standard, immune from bacteriosis. Judging from illustrations and reports the oversea varieties are far superior to our common types in every respect.

It will also be necessary to introduce different varieties of the indigenous black walnuts of America for root stock purposes, not alone to prove or disprove their virtue as a seedling stock for perpetuating selected and choice varieties by grafting and other methods adopted, but to prove that by using such stocks the walnut could be grown to better advantage in certain localities than by using the common English seedling as a stock. Because a certain species of the black walnut is highly spoken of in California for root stock purposes, it is not to say that such will be the case in Victoria. It remains to be proved whether the black species is superior as a stock under Victorian conditions to the English walnut seedlings.

Climate.

Generally speaking, the English walnut is a hardy tree, withstanding a far greater degree of cold during the dormant season than the lowest temperature registered in our temperate clime. The greater danger is in the spring, with severe frosts after the trees have commenced growth, the young shoots, tender foliage, catkins, and pistillate fruit being damaged more or less. This can be obviated to a great extent by selection. Walnut trees vary widely in the time they come out in the spring; in localities subject to severe late frosts propagation from suitable late maturing trees should be practised. Still, the risks of injury from frosts in this State are no greater with the walnut than with the almond or peach, as they all flourish in like localities. Regarding high temperatures, although the walnut can withstand droughty conditions as well as most of our cultivated fruits, yet it does not take kindly to extreme heat or hot, dry conditions; the majority of the trees found growing under these conditions were generally stunted, many having the terminal portion of the boughs dead or dying back. Besides these conditions the dying and burning of the foliage gave no protection to the nuts, which were spoiled by having the pellicle (husk) sun-burnt (Illustration (5)). Trees under these conditions can be greatly improved by supplying them with abundance of moisture during the dry periods.

Nut planting for commercial purposes should not be thought of in extreme hot or dry districts, where this tree is not at all adapted. In warm districts where there is a plentiful supply of water, and soil conditions are favorable, a type of tree naturally of thrifty, vigorous growth, and having large and abundant foliage, so as to protect the nuts from the sun, should be selected for planting.

The walnut is found to flourish extensively throughout the State, showing that it adapts itself to a wide range of climate if soil conditions are genial and favorable.

In districts remote from railway communication, where necessarily the cost of haulage would be considerable, the nut harvest could be profitably handled, as it is a comparatively high-priced crop, and not of a perishable nature.

(To be continued.)

WINTER TREATMENT OF THE DAIRY COW.

J. M. Kerr, Dairy Supervisor.

That the milk yield is influenced by weather conditions is common knowledge to all dairymen, and even in our comparatively mild climate cold weather is frequently responsible for a reduced milk flow. This is due, apart altogether from the shortage of fodder to which most cows are subjected during the winter months, to the cold temperature acting directly on the animal. Farmers, too generally, have resigned themselves to the loss as inevitable, and few indeed deem it worth while to protect their cows from these frequently-occurring extreme conditions. Some of the better dairymen do certainly endeavour to meet them by liberal hand feeding, and no doubt they are on the right track in so doing. But to claim that, by supplying food unstintedly, one is doing all that is called for is only half wise. Few men would be prepared to face a winter night in the open, depending only on a heartily-eaten supper. Certainly, a well-fed cow is better equipped than an unfed one to withstand the rigour of a cold and squally winter night, and in view of the number of dairy cows which compulsorily suffer from seasonal semi-starvation, the man who feeds his cows well is to be commended. The man who does not endeavour to meet the cows' needs even in the way of feed, is probably beyond any written appeal; but, to that better class of farmer, who recognises that it is only by proper treatment that the dairy cow can live up to her reputation of turning half-sovereigns into sovereigns, a truer understanding of the animal economy is the only thing necessary to insure proper treatment being given.

Liberal feeding is good, but it is part of the battle only. Piling coal (which costs money) on the fire is one means of keeping a room warm; but what about shutting the windows (which costs comparatively little)? No one will dispute that coal would thus be saved, and what is used rendered more effective. The one action is supplementary of the other, otherwise fuel is needlessly being wasted. The dairyman depending solely on a "good belly-full of feed" for his cow (to keep out the cold) is right to a certain extent, but still wasteful.

To understand how the analogy of the fire and the window applies to a milking cow, some explanation of the animal's economy will not be out of place, for no doubt there are many dairymen busily facing the problems of their vocation who would be at a loss for an answer to the question so pertinent at this season, viz.:—Why should a fall in temperature cause a cow to yield less milk? If a cow-keeper has only an elementary knowledge of how this occurs, it will enable him to get better work out of the living machine he is employing, while mutually benefiting himself and the cow.

All know that cows' flesh, if dead, will vary in temperature with every variation in the temperature of its immediate surroundings. Frozen beef, when removed from the cool chamber, will conduct heat from the warmer atmosphere into itself, perhaps to a degree equalling the weather temperature, and if then returned to cool storage, will give back this acquired heat to the surrounding atmosphere of the chamber until the original low temperature is reached; for heat will always pass

from a substance or body in which it is plentiful to an adjacent one in which it is less plentiful, and the greater the variation in temperature the quicker the loss from the warmer body.

Though a cow's warm body undoubtedly imparts heat in this way to a cold atmosphere her internal temperature shows no material variation. Therefore, there must be some source of heat in the animal herself from which new heat is generated to meet the loss as it occurs. And the *maintenance of a uniform body temperature is known to be absolutely* essential, because any greater variation than a few degrees above or below 101 deg. F. could not be survived. To supply this degree of heat to her blood and body, and to maintain it in spite of rapid loss, is part of the function of her digestive system, as will be shown. The conservation of this heat when generated is regulated, within certain limits, by sensitive nerves with which her skin is endowed. Controlled by these nerves the sweat glands and pores act as safety valves for the heat which is generated in the digestive apparatus and distributed through the system by the blood stream. By automatic distension or constriction of the blood vessels and pores, heat is released or conserved respectively, *according as the tendency may be to rise above or fall below the normal* 101½ degrees.

Digestion is a process of combustion similar to what takes place in an ordinary fire, only *slower*. In a fire the material burned is the carbon in the wood or coal, or (more inflammable still) the hydrogen of petrol or kerosene. The fuel for the heat supply of the cow is the hydrogen and carbon contained in the fodder, and here again hydrogen shows itself to be the more combustible. If a cow's temperature be taken on a frosty morning or in a driving hailstorm, it will vary practically nothing from her temperature on a scorching hot day. Despite intense coldness of the air around her, and the consequent more rapid passage into it of heat from her warmer body, hydrogen and carbon are being consumed within, and heat thereby generated to meet the loss as it occurs. But naturally, more fuel is needed, and the cow's appetite calls for the needful. *But how often in vain?*

When this extra food is not forthcoming, the fat which would otherwise go to constitute the fat of milk and "condition" is "commandeered" for fuel; and, this failing, heroic measures have to be resorted to, and the fat of her own body is called into requisition, resulting in the poor winter condition and poor milk yields of most of our dairy cows.

The sensation of "feeling cold" is the warning that the system is experiencing difficulty in keeping its temperature up to normal, and the animal responds by seeking shelter if available. In intense cold the heat regulating nerves of the skin and surface blood vessels are taxed to their utmost capacity, if not beyond, to retard the escape of heat. Through *constriction of their supplying vessels the sweat glands are stopped* secreting; the nerves of the skin also close the pores (goose-flesh in the human being); the external blood vessels are constricted generally (by their automatic nerves), thus reducing the amount of blood conveying heat to the extremities; and all this occurs with the one object of conserving the heat deep in the body whence the cold air cannot so readily steal it by conduction and evaporation.

Seeing that the body heat is originally dependent upon the food, and that the quantity of food required depends on the amount of heat and

energy so lost, or, shall we say, wasted, anything the farmer can do to lessen this escape of heat must reduce the (to a great extent, needless) consumption of expensive food, as well as conduce to the comfort of the cow. With milking-cows the action will serve a two-fold purpose, for, in the arrest of the immoderate loss of heat, the blood circulation becomes better distributed, and is restored once more to the extremities of the body—the udder included. A chilled udder is practically a bloodless udder, and a bloodless udder is necessarily a milkless one. Milkers have probably noticed how a cold, shivering cow will keep them waiting for her milk to flow, and in such case it will not flow until the continued action of milking or the warm shelter of the shed has stimulated a flow of blood through the gland.

Now, although the cow is provided by nature with the protective nervous system, partially described above, which withdraws the blood to the internal organs when heat is being removed from it too quickly, and which conducts the blood to the extreme surface to perspiration point, when an excessive rise is threatened, too much should not be expected of any automatic system, especially in an animal carrying as much artificially-imposed burden as the present-day dairy cow.

This natural protection which all cows possess would meet all requirements when the cow was in her undomesticated state, free to obtain shelter for herself and free from the heavy tax of milk production for man. And it is wonderful over what a wide range of temperature, even with this handicap, the operation of the system's automatic adjustments will preserve the life of the animal. But a cow merely alive is not necessarily an efficient dairy beast.

Subjected beyond certain narrow limits of temperature variation a cow's life can only be maintained at the sacrifice of efficiency, and in the dairy cow efficiency and profit are one and the same. It is only what the cow's stomach can spare over her own immediate body-needs that goes to produce "condition" and milk; and in the true dairy cow (differentiating her from the beef animal) it is principally in the udder that any surplus is utilized. But in the cold weather, what a number of udders are in the position of Mother Hubbard's dog!

What the stomach can spare to the udder must depend (like a man's pocket) on income and expenditure, and it has been shown how the stomach's expenses are increased to meet the demands of a cold "snap," which demands will vary in degree according to the protection afforded.

Here, then, is the farmer's clue. Effectively maintain, or, better, increase the revenue (feed), and curtail the expenditure (heat loss) during the prevalence of cold weather, and the cow will be as well fitted to produce milk as if the severe weather conditions were not present; because, in spite of them, a surplus of the raw material for the udder's use is thereby assured. And, assuredly, something should be done on such an occasion.

To reduce the escape of valuable body heat several means are at the farmer's disposal. One is by substituting for the moving atmosphere of the open paddock the comparatively still air which a shed provides. The power of the atmosphere to absorb heat from a body is practically only effective while the temperature of the air is lower than that of the body, and naturally it is the tendency of the adjacent air to rise in temperature as the heat is being absorbed. It therefore can be under-

stood that, were the same air to remain in contact, it would not be long before it became as warm as the body, and its power of absorption cease. This, in a modified degree, is what occurs in a shed. But, in the open paddock, the adjacent air, as it absorbs heat, is being continually displaced by fresh, cold air borne in the wind, and hungry for heat; and the cow's poor, unprotected body must yield up the spoil.

All this may be obviated by shed accommodation, but housing is not yet popular among dairymen here, and the idea, where regarded at all, is considered either antiquated or revolutionary by many. Housing of cattle is altogether condemned by many Australian farmers, and rugging also has many opponents here; but the arguments used against both methods invariably reveal themselves based on the abuse of the practice mistaken for the use. Both systems can be practised in such a way that the good purpose is largely nullified, and the objections so commonly raised are not altogether unworthy of consideration. Housing of dairy stock is the rule in all the old-settled cold countries, and in many the animals are never out during the whole winter, except for exercise. There is no doubt that on very small holdings, heavily stocked and intensely worked, it will justify itself here—that is, in the severest portion of the winter season.

It is quite difficult to understand what is accomplished by compelling a herd of cows, whether large or small, to turn out of the shed into paddocks, devoid of pasture, on bleak and wet winter nights. It cannot be to get the necessary food, for very often a cow could not fill her stomach in a week on the amount of pasture available, and the effect is certainly to cause them to lose most of the benefit of the food they have received in the bails. Cases occur where no reason can be vouchsafed except that it saves the labour of attending to them in the stalls. It must be admitted that this reason (in the present shortage of rural labour) gains validity as the size of the herd increases, but with a small herd it cannot apply. Housing has been often condemned as non-remunerative without a fair trial, when it was insufficient feeding which should have been blamed, because so rarely is a cow properly fed when the food has to be supplied by hand.

It is so uncommon to find a dairy farmer with sufficient of any kind of feed on hand for liberal feeding, and it is rarer still to find a store of the concentrated foods with which to properly balance the ration. Owing to the inadequate supply on the farm, what there is must be carefully husbanded to last the winter, with the consequence that the cow is stinted of a suitable ration, and it is housing which is discredited by the disappointed owner. Under these circumstances, it is not surprising that the cows do as well outside, and the farmer who is not prepared to properly feed his cows when stalled overnight might be quite honest (should he have pasture) in his contention that he has found housing of no benefit. The comparison will be still less favorable to housing if rugs are used on the cows outside. Many object to keeping their cows in the shed because of the dirty flanks caused by adhesion of dung, &c.; and, if this were impossible to remedy, it would also be a most valid objection. But this can be almost entirely prevented by proper construction of the stall floors. Immediately behind the cows' hind feet (when standing comfortably) there should be a straight drop of about 8 inches. The outer edge of the gutter thus formed should be 12 inches

from the inner edge, but need not, nor should it, rise to the same height. Three inches on the outer side is sufficient depth. This enables the cow to see the grip better, and so not be tripped up when entering or withdrawing from the bail. Further, if there is any banking of manure during the night, it will tend away from the animal. The cow, chained rather than bailed, is thus up on a low platform, and the dung, dropping over the edge, rarely comes in contact with her body when lying down. If any manure should become attached, no trouble will be experienced in removing it if it is not allowed to dry, but manure-covered flanks should not be tolerated. Bedding, of course, is necessary, but is available on but few dairy farms as at present managed. The exaggerated feeding value of straw, and the generally insufficient area cultivated, are chiefly responsible for this, because, owing to poor provision of winter fodder, no part of the crop can be spared for any other purpose. But if those wise dairy farmers who do grow plenty of oats realized that the butt-end of the oat sheaf, being only woody fibre, takes up room in the cow's stomach altogether out of proportion to its nutritive value, it would be more often deliberately discarded, leaving room for a more sustaining ingredient—the ingredient which is almost always crowded out, viz., protein. But what do we find? Instead of excluding this almost valueless portion of the sheaf, most farmers go to extra trouble of chaffing the hay, to make the cows eat it, though the same men would regard with horror a bill for the additional amount of protein the ration requires, through its inclusion. Needless to say, the cows never see this protein. If the farmer is not prepared to purchase proteid foods to balance the poor-quality straw, much the same thing can be accomplished by feeding a greater quantity while excluding this portion. Should he have no better means of removing the butt, a block and sharp broad axe, and his own energy, will suffice, and both the energy and time required will be less than would be necessary for chaffing the same amount with a hand chaff-cutter. Of course, when speaking of housing at all, one must limit oneself to small herds, in the present condition of the labour market. A simpler, though not quite so effective, way is by feeding the hay whole to the cows, and allowing them to reject the tasteless portion themselves. And if the crop be a short one, this method will be little less effective, and is recommended. Properly fed cows will usually leave the lower portion of the stalks uneaten in the feed boxes, and in cold weather, if short hay be so fed, their discrimination may generally be trusted to leave nothing of much feeding value. This is regarded as too wasteful by many farmers—particularly those who believe in chaffing. But chaffing, as generally practised, is infinitely more wasteful. Though straw in the feed boxes looms large in the farmer's eye, and the bulkiness of the apparent waste alarms him, the feeding value so lost is not to be compared with that of the oats which pass undigested through the animal when chaff is fed. Most cows bolt chaff without crushing the grain, which is consequently unutilized. By feeding whole hay, not only is the grain more thoroughly masticated, but its prolonged retention in the mouth gives the necessary time for the saliva to act, without which digestion must be imperfect. Animals with teeth must retain food a certain time in the mouth if digestion is to be thorough, and the capacity to digest well the food eaten is more often responsible for a cow being better than her fellows than is generally

realized. This recognised, it ill becomes the chaff feeder to say hay feeding is wasteful, and so long as he continues unobservant enough to waste valuable oats to save comparatively worthless straw, scarcity of bedding will probably continue to be the excuse for not housing. The most common error of dairy farmers is in stinting their cows of protein, no doubt because it is rare and expensive; consequently, if any part of the hay is to be unutilized for feed, let it not be the grain, which is rich in this ingredient. The poorest portion of the sheaf can better be spared, particularly as it need never be altogether wasted like the oats in the dung. Its room makes possible a better-balanced ration; the obviation of chaffing means a better assimilated grain, and its availability for bedding makes possible a better protected herd and better manured green crops. Threshing is not advocated, for the extra ripening required is detrimental to the straw as a fodder, and also because loose oats are difficult to feed economically to ruminants. On the small holding, impossible without humus-manure, the wisdom of reserving the lower part of the sheaf for bedding need never be doubted. All this entails labour, but it is remunerative on such a farm, where wages have not to be considered. Cows are not housed in any country for six months of the year for love of the thing, and the efficacy of housing on occasion here can hardly be disputed; but an advocate of housing large, or even moderate, herds in this country finds the practicability harder to demonstrate than the utility, and cannot persist against the unanswerable objection—the undoubtable scarcity of reliable labour.

Another means of accomplishing the same object, though in lesser degree, is by rugging. The rug, being of bad conducting material, arrests the passage of heat from the body by keeping the cold air from coming into direct contact, and thus the body warmth, so expensive to produce when it is most needed, is economized. The farmer who realizes this must also realize that the food so saved, and the maintained milk-flow, create a fund far exceeding the cost of the rugs, particularly if a cheap material, such as jute, is used. This, though not as durable as canvas, requires a much less first cost, and a pair of cornsacks sewn together serves the purpose well, becoming quickly rain-proof by taking up the natural grease from the hair of the animal.

If not of waterproof quality, the rug is of little value, because the principle of the thing requires that, not only should it intercept the conduction of heat from the cow's body to the colder atmosphere, but it should also prevent access of rain to her skin, because when cold water is allowed to come into contact with an animal's body, heat is absorbed into the water, very quickly raising it in temperature to evaporation point. In thus converting water into vapour, heat is changed into energy which will not remain in contact but will pass off as steam, while cold water will continue to take its place. As the body heat has an uninterrupted passage into the cold rain water, this accelerated waste of heat goes on, and, with porous rugs, the water and skin are always in contact. If the rain is kept outside the rug, evaporation, though not entirely prevented, is greatly reduced, because to reach the water, the heat must first pass through the dry material of the rug which, being a bad conductor, permits it to do so very slowly. And the cow is the gainer.

But, effective as rugs are to keep the warmth in an animal, harm can come of their injudicious use, and regular attention to them is necessary. The possible evils have only to be recognised to be avoided. Care should be taken to fix the rugs securely, otherwise (as it is only at night and during cold weather that they should be resorted to) their disarrangement on the animal may occur unobserved. This exposes the cow suddenly to the cold—always a risky experience for a sensitive milking cow. In this regard well-fed cows are less likely to disarrange or lose their rugs than their less fortunate sisters which have to forage all night in search of pasture which may not exist.

The health of the cow during cold weather, and particularly her ability to withstand sudden falls of temperature, depends largely on the sensitiveness and activity of the skin nerves (already mentioned) to quickly close the pores, thus preventing an excessive loss of body heat. With the rugs left on continuously, and never removed even on warm days, this function of the nerves is not so actively exercised, and is liable to become impaired and sluggish in consequence. When the protection of the rug is eventually dispensed with, should a sudden change occur, the response of the nerves may not be made readily enough to prevent a dangerous escape of heat, and a chill is apt to result. This is made more liable by the thinning or, perhaps, the entire loss of hair, which often results through its function of keeping the cow warm having been supplanted by the rug. The loss of hair, so undesirable in itself, does not occur until the cow has suffered much discomfort through the intense itching which accompanies it, and, probably, vermin, which the continuous use of rugs seems to favour.

It should therefore always be borne in mind that, though the judicious use of rugs will conduce to the comfort and well-being of the animal, as well as economize the feed, they should only be donned during wintry conditions, as frequent freedom from such artificial protection is necessary to the welfare of the cow. It is because the Victorian climate does not call for their use continuously enough to injure the cow that rugs can be recommended here as a substitute for housing. If the climate were such that they could never be dispensed with, housing would always be recommended in preference, despite the extra labour which it entails.

Paddock shelters and plantations, acting as windbreaks, also afford much relief, particularly if supplementary to rugs, for even though rugs be resorted to, the extreme conditions against which they are designed to protect can be greatly modified by windbreaks in the paddocks, either constructed or grown, or both. On the leeward side of these, even though a cold wind be blowing, the atmosphere will be comparatively still—a condition which has been shown to considerably relieve the heat-maintaining system of the animal. Compared with housing and rugging, windbreaks cannot reasonably be expected to assist the conservation of heat to the same degree, but, in conjunction with and supplementary to rugs, protection is afforded to an extent far beyond what either method would furnish alone. Rather than the bare, bleak paddock to which many dairy herds are committed on winter days or nights, irrespective of rain, hail, snow, or blizzard, cows, in their efforts to escape the torture, will turn to any shelter whatever, even though it be only a post-and-rail fence.

A dense plantation, from which cattle are excluded, furnishes a break right from the ground upward, but, if stock have access to the trees, all the lower leaves are stripped to a height of 5 or 6 feet, and in such case something to close up the open space is required. This may be done by a fence of palings or bark along the leeward side of the line of planting. Even sawn hardwood so used is not out of place, for, protected by the trees, it is long lasting, and, if an ordinary fence be continued around the remaining sides, would serve to protect the trees in turn. If the trees are not to be supplemented in some such way, a much greater number, giving greater depth, will need to be planted for the same effect, and some kind of effective surrounding fence should never be omitted.

No plantation will continue effective if the cows have access to the trees, for, not only do they injure the bark, but the tramping exposes the surface roots, and it is this latter which is chiefly responsible for the non-survival of the native eucalypts, when the forest has been reduced to single specimens scattered at intervals over a farm. If cattle are excluded, it will be found that the grass around the stems becomes a menace in summer time. As this does not justify the protecting fence being dispensed with, the danger should be anticipated by burning or ploughing a narrow strip as a fire-break around the clump early in the summer. The destruction of many a handsome plantation by fire has often been due to the encircling fence which was erected by the owner for its protection.

Plantations are not the less useful for being ornamental, but people are to be found who think they are better off without such ornaments. After their exaggerated costliness, the chief objection appears to be that, by attracting the cattle to crowd around them, a puddle is created in wet weather, and the animals lie in this quagmire of their own making. The congregation, in itself, proves that the cows find the benefit of the shelter, and something is at fault when such protection does not prove solely beneficial. The clumps are not always planted where they would receive the least amount of surface water in wet weather. This should always be studied when selecting the positions before planting, for it is seldom that the water which actually falls as rain on the camping ground is responsible. Provision is rarely made to divert what surface drainage there may be from the higher ground, though a single plough furrow properly struck would serve. If these precautions are taken, and the ground still cuts up unduly, it is owing to the number of groves being too few to accommodate the cows. More planting is the remedy. And it will never fail to be worth the trouble.

It was stated further back in this paper that, to better conserve the cow's body heat in cold weather (so that more of its raw material might be available for and diverted to the udder), both its source (income) and loss (expenditure) should receive attention. The means of curtailing the expenditure have now been dealt with, which (reviving the fire and window simile before used) is analogous to shutting the window—a very wise first step towards warming a room. The source of heat or "revenue" aspect has now to be considered. This, in the simile, is represented by the fire, and, before piling on the coal, it may be well to state that good results need not be expected if wood is shoved into a fireplace designed for coal. Figuratively speaking, this is frequently

done in "stoking the furnace" of the dairy cow. A cow's stomach is designed by nature to hold only a certain amount of food. Grass and clover is the natural food or "fuel," and, being natural, the bulk which her stomach can accommodate contains just the amount of nourishment required under normal conditions. This nourishment exists also in other foods in varying proportion, even in wheaten straw, provided 5 cwt. could be eaten at a meal, but *the necessary nutriment is not present* in the amount of straw a cow's stomach will hold. Her digestive system not being designed large enough by nature for such food, when she has swallowed *a fill she is still short of the necessary nourishment.* *But once* full she can eat no more, and the effect is that if straw be the only food available, she goes incompletely nourished, or partially starved, and good returns are just as unlikely from such an animal as intense heat from the amount of wood which a coal grate will hold. Just as all fuels are not suitable for a particular class of stove, any kind of food is not suitable for a cow's "furnace"—her stomach.

Even though the "window is shut," it might be well to consider, before "heaping on fuel," whether the best fuel for the particular class of fireplace is being used. Though the amount of grass and clover with which a cow's stomach can comfortably deal contains all the nourishment she requires under normal conditions, enclosure in an exposed and shelterless paddock on intensely cold and stormy nights is an emergency, rather than a natural, condition, and there is never a fill of grass and clover available at such a time. If cows are to be so subjected, attention should be paid to the quality as well as the quantity of the ration supplied. And it is because there is a limit to the quantity she is able to eat, and because the ingredients really required are so often deficient, notwithstanding that her stomach is full of food of a kind, that quality is often the saving factor in such an emergency.

Although artificial protection, in the form of shed, rugs, or windbreaks, be provided in cold weather, and act well in assisting the cow's automatic nervous system to reduce the escape of animal heat, the rate of loss is still considerably greater than in warm weather, and the duty of meeting the increased demand is thrown upon the digestive system. Ordinarily, carbo-hydrates (starch and sugar) and some fat are the ingredients in the ration, principally depended upon in the digestive process to provide the requisite heat, and under normal and genial conditions *the amount necessary to be consumed for the purpose does not* exceed the capacity of the cow's stomach. But, under such an emergency as extreme cold, if additional carbo-hydrate alone were available, *the cow would fare badly, for the reason that, being relatively low in* heat value (as compared with fat), and comparatively slow of combustion (like wood compared with petrol), the bulk is large in proportion to the heat furnished, and the limited capacity of the animal's stomach prevents her taking in a sufficient quantity of such food to meet such an emergency demand. It is here that fat serves.

This more concentrated form of heat-giving food—the vegetable oil—seems to have been specially provided by nature for the purpose of meeting the demands made on the animal economy by low temperatures. Fodders contain it in varying degree. It thus is present to some extent in any ordinary ration, and, providing it is not in excessive amount, is well utilized always. The hydrogen content of the fats is

much greater than that of carbo-hydrate, consequently much less bulk is required to furnish a given amount of heat. A little fat goes a long way in heat production, and, if fatty food is available to the cow, her stomach can generate extra heat according to demand, and never fail for want of room to accommodate the fuel. Animals, during intensely cold weather, will relish and assimilate an amount of fat in their food which, in warm weather, would altogether upset their digestion, and at such a time the relish appears to increase with the urgency of the demand. This is demonstrated by men in polar regions making meals of almost pure fat, in the form of blubber.

If, therefore, a cow is allowed during cold weather to fill her stomach with fodder rich in hydrogen, it may be assumed that she has a better chance of maintaining her body temperature, and, with it, a better blood circulation and milk flow, without sacrificing "condition." Maize meal, cotton seed meal, linseed meal, and crushed oats, though not very much used in feeding generally, will well repay a trial in cold weather, and such foods doubtless serve their true purpose at such time. At any rate, it should be seen to that the dairy cow is receiving the full sufficiency of fat in the daily ration, when conditions are such as to call for increased combustion. As stated before, despite the protection which can be afforded in the way of windbreaks and rugs, more heat is lost in cold weather than in mild weather, and the full effect of proper housing and hand feeding will always be somewhat nullified by the restriction which it imposes on the cows. Cows vary in temperament, and there are always some which do not take kindly to an enforced alteration of their daily habits. This peculiarity is insuperable, and, when a herd is being dealt with, will always be responsible for the fact of artificial assistance not quite counteracting the effect of low temperature. But it is unquestionable that more is due to our cows than they at present receive, and if the suggestions herein be acted upon, a mere fall in temperature would cease to be marked, as now, by a serious diminution in the milk yield. The benefit would be mutual to cow and owner.

FISH MEAL FOR PIGS.

Mr. Sanders Spencer, a Scottish authority on pig breeding and feeding, writes to the *Free Press* dealing with the above subject, and stating that he found a proportion of 10 per cent. of the fish meal gave the best returns.

Further, he found food mixed with this proportion did not injure the flavour of the pork. The latter trouble is said to arise when the meal contains an undue percentage of oil.

Extract from "Fertilisers."

21st March, 1914.

Fish or whale guano has been imported into Victoria from Sweden but, as far as can be learnt, it was placed on the market as a manure and poultry food.

DEPARTMENTAL POTATO EXPERIMENTS.

The Department of Agriculture will this season undertake potato-growing experimental plots under both irrigated and unirrigated conditions. Mr. J. T. Ramsay, Government potato expert, has drawn up a plan of action which has much to commend it to potato-growers. The principal features include spraying and dipping, and depth of planting tests. The value of these will be recognised by all engaged in the industry. The design of the experiments is based on an endeavour to also thoroughly test the use of immature as against mature seed, and to prove the effect on production of various manures applied singly and in combination. A large number of different kinds of potatoes will also be grown. One of the acre plots at Leongatha, of which there are six, will be planted exclusively with seedling and English seed potatoes. The seedlings embrace some of the best grown last year at Romsey by Mr. George Seymour, formerly Government potato expert, from pedigreed seed sent to Australia by Dr. J. H. Wilson, a member of the Scottish Commission which toured the Commonwealth in 1910-11. The crosses are the result of working a red-skinned variety, which Dr. Wilson procured from New Zealand, on a number of British disease-resisting kinds. It is probable that some of these crosses will prove prolific croppers suited to the climatic and cultural conditions of the State, and the result of this season's planting should prove highly interesting in that connexion.

Plots of one acre each will be laid out as follow:—No. 1, half ripe, half immature seed, unmanured; No. 2, an equal division of both classes of seed, manured; No. 3, seedlings and English seed; No. 4, half an *acre spacing test, half an acre depth of planting test, two varieties of* tubers; No. 5, half the crop to be dipped and sprayed, half untreated, two varieties; No. 6, to be fertilized with superphosphates, potash and superphosphate, superphosphate and sulphate of ammonia, these three combined and sulphate of potash and sulphate of ammonia by themselves. The conclusions arrived at should be of the utmost importance to potato-growers. They should help toward the solution of the vexed question as to which is the most profitable manurial application, a matter which is giving farmers a deal of perplexity. About two acres will be planted at Bamawm, an irrigation settlement near Rochester. There immature seed will be submitted to a similar test. Spring and autumn crops will be tried, the initial planting having been arranged for during the first week in July. The growing crop will be irrigated as occasion demands. The few who have grown potatoes in the irrigation settlements in Northern Victoria have achieved a unique success. The sample produced has been of the greatest excellence, and the prices which have been obtained make the crop a highly payable one. The tubers can be ripened early, and are available for marketing at a time when prices are high. —*Argus*, 30th June, 1914.

BEE-KEEPING IN VICTORIA.

(Continued from Page 409.)

By F. R. Beuhne, Bee-Expert.

XXV.—COMB FOUNDATION—*continued.*

The foundation mill, as seen in the illustration Fig. 4, consists of two type metal rollers on steel spindles, one above the other, running in bearings set in the cast-iron frame-work. To the projecting axle of the lower roller a crank handle is attached, by means of which, and the cog wheels at each end of the rollers, the latter are revolved. The bearings of the lower roller are fast in the frame, while those of the upper one are capable of being raised or lowered and moved sideways. Rubber cushions, or, in the latest machines, steel springs, between the upper and

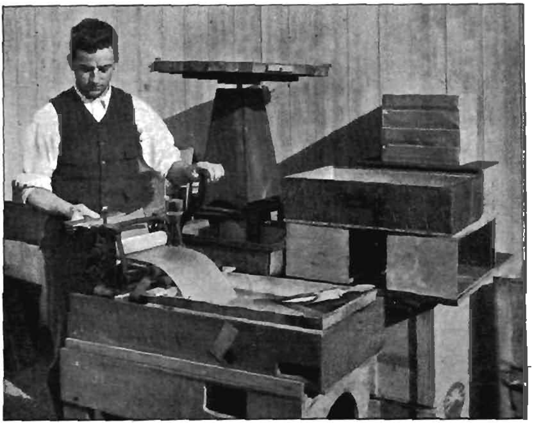


Fig. 4.—Rolling the Sheets.

lower bearings hold the rollers apart, the closer setting being accomplished by means of two vertical set screws, which force down the upper bearings and thus bring the rollers together.

It is absolutely necessary that the rollers should be perfectly parallel, both vertically and horizontally, otherwise good workmanship cannot be expected in the sheets of foundation. The horizontal adjustment is made with the vertical set screws, while the top roller is set true to the lower one, vertically with four lateral set screws at each end. By means

of these screws the bearings can be moved slightly sideways. The machines as received from the manufacturers are correctly set for working, the only adjustment which may be necessary being the raising or lowering of the top roller according to the thickness of the sheets to be rolled and the grade of foundation to be made.

If, however, the rolls by some means should have become untrue in alignment, some exceedingly delicate adjustment of the lateral set screws controlling the upper bearings will be necessary before good work can be done. The rolls, as stated, are of type metal, and are engraved in such a way as to correspond to the cells of worker comb. Each of the multitude of little stamps is hexagon in shape, the top coming to a point formed by three inclined planes. The cog-wheels which connect the rollers are fixed on the spindles in such a way that if the mill is correctly set the point of each cell stamp on one roller falls evenly between the points of three of the cell stamps on the opposite roller; but if the rollers are not set true, holes will be torn in the wax sheet, and the rollers may be damaged, or the three planes which form the cell bottom of the foundation will be uneven in thickness, causing stretching or tearing of the sheet during rolling or sagging after the sheets are fixed in the frames of the hive.

When freeing the interstices of the rolls of particles of wax, or on first loosening the end of the sheet when it comes through the machine, metal prickers or tools of any kind should not be used, as type metal, being soft, is easily scratched. A tooth-pick or a piece of comb may, however, be employed.

The foundation machine should be securely screwed to a table of suitable height, or, better still, to a separate stand, with a flat water tank for warming the wax sheets immediately behind the mill, as seen in the illustration (Fig. 4). The water in which the sheets are warmed before rolling should be 110 deg. Fahr. for ordinary foundation, and 115 deg. to 120 deg. Fahr. for what is known as thin, surplus, or section foundation. The temperature is regulated by means of a stove or lamp under the water tank, and a dairy thermometer in the water. The machine will work best when the rollers are nearly blood warm—that is, when they feel neither warm nor cold to the touch of the hand. If the temperature of the room is less than 75 deg. Fahr., it may be necessary to first warm the rollers by pouring warm water from the tank over them while revolving them, and then allowing them to cool down to the required temperature. After work has been commenced, the continuous passing through of the warm wax sheets will maintain the correct temperature.

To prevent the wax adhering to the type metal a lubricant is necessary; soapy water is generally found to be the best, or an emulsion of starch may be used. This is either kept in a shallow trough, in which the lower roller revolves, or applied to the upper roller with a soft clothes-brush; care should be taken to do so after every sheet. Soap has been objected to as acting on the wax; it does not, however, affect wax in the solid form, and if the trimmings of the rolled sheets are washed in tepid water before being re-melted, the wax will be in no way affected.

To have the sheets of even temperature before they pass through the rollers, and thus secure uniform thickness and embossing, it is best to warm the plain sheets singly instead of putting a whole pack into the

water. Wax being lighter than water, the top of the pack is more or less above the surface of the water, and the sheets do not warm up evenly when in contact with one another. If the stack of plain sheets is kept handy alongside the warm water, no time is lost in warming the sheets singly, for while the warmed sheet is taken out of the water with one hand another sheet is dropped in from the other, so that one sheet is always in the water while another is going through the mill, every sheet being warmed for the same length of time.

If in the dipping of the plain sheets, previously described, the correct temperatures for the different thicknesses are observed, only two dips will be needed for each board instead of three or four, as given in some of the text-books, and while the reversing of the boards makes a much

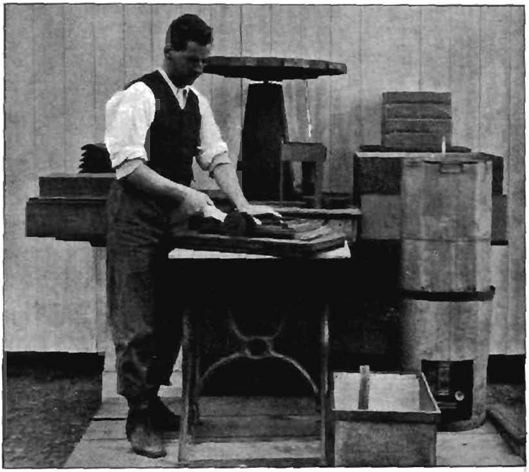


Fig. 5.—Trimming Comb Foundation.

more even sheet than repeated dipping from one end, it still leaves one end slightly thinner than the other. It is this thinner end which is entered between the rollers; the latter are turned till sufficient of the sheet is through; this is rapidly picked loose with the finger-tips, the loose end caught in a gripper, and a slight strain kept on the sheet with one hand while the handle is turned with the other, when the rolling is done by one operator only. It is important that the right end should go through the machine first, when reversing the boards has been practised in dipping, because the rollers can then be set closer, resulting in better kneading of the sheets, and, consequently, a better quality of foundation.

The gripper puts an even strain on the sheet in pulling it off the roller. If one has not been supplied with the machine, it can be made by any one. It consists of two pieces of pinewood, 9 inches long 1½ inches wide, connected at the ends by semi-circular pieces of clock spring, which hold the two pieces of wood apart till closed on the end of the sheet by pressure of the fingers.

The sheets as they come off the rollers are laid evenly end for end on top of one another, the curled end being smoothed down by hand till eight or ten have accumulated, when they are ready for trimming.

Trimming the Foundation.

As the rolled sheets are 9 inches wide and 18 inches to 20 inches long, trimming to the required size (16¾ inches x 8 inches for Longstroth frames) is necessary. This is best done while the sheets are still slightly warm, by placing a board of the proper dimensions on top of the sheets and cutting the edges and ends off close to the board with a suitable knife dipped in soap water or as shown in the illustration (Fig. 5), with a disc cutter warmed over a small lamp. This cutter consists of a circular piece of thin steel sharpened to a fine edge and fastened to an axle 3 inches long revolving in a fork piece fixed in the handle. A dummy cutter of the same size at the opposite end of the spindle insures straight and even cutting, which will be found of great advantage when the foundation is being fastened into the frames.

When quantities of foundation are made something of the nature of a turn-table will be found very useful. This is simply a board fastened to the top of a table or stand by a screw in the centre, round which it revolves. It should be large enough to leave room all round the sheet for the guide wheel of the cutter; and is moved a quarter of a turn after each cut, thus doing away with the necessity of walking round the board to cut the four sides or to shift the pack of sheets.

The trimmed sheets are lifted in a body, and put into packs of not more than 5 lbs., with a straight board between the packs, so that the sheets may set perfectly straight and even.

When comb foundation is kept over through the winter it will sometimes become somewhat brittle, and show a whitish film on the surface. By exposing it for a short period to the rays of the sun, or to mild heat from a stove, this film will disappear, and the sheets become pliable again.

(To be continued.)

AGRICULTURAL CO-OPERATION IN AUSTRALIA.

By P. J. Carroll, Senior Inspector, Dairy Produce.

As the result of careful and exhaustive inquiry into the matter, it has been found that, notwithstanding the very appreciable extent to which the principle of co-operation in agricultural affairs is admittedly being applied in the various States of the Commonwealth, practically no detailed information of a general or statistical character has, as yet, been made available on the subject. In New South Wales, Victoria, and South Australia particularly, and, to a lesser degree, in Queensland, Western Australia, and Tasmania, the conduct of business on the co-operative system has yielded the most beneficial results to those concerned, and there are on record several instances (a few of which will be quoted later on) where the efforts of individual societies to promote the welfare of their members have been attended with conspicuous success. It may be taken, therefore, that the experience of Victoria in this connexion is, to a greater or less degree, representative of what has been, and is being, achieved in the other Australian States. For this reason, and in view of the difficulty above referred to of obtaining trustworthy figures and minute information on the subject as pertaining to the Commonwealth, it is proposed in this article to confine attention chiefly, if not exclusively, to the rise and progress of agricultural co-operation in the State of Victoria.

Early Efforts in Victoria.

About the year 1888 the production in this State had exceeded the local demand, and prices fell so low that the occupation of farming failed to provide an ample return to the tillers of the soil. Cereals, root crops, and dairy produce were selling at ruinous prices, and insolvency was staring producers in the face. A Royal Commission, called the "Vegetable Products Commission," was appointed for the purpose of "inquiring and reporting respecting the vegetable products other than wheat, for the growth of which the climate of Victoria is suitable.

Wheat was then the farmers' staple product, but owing to the competition of other countries it became less profitable, and one of the main objects of this Commission was to indicate to farmers and others how they might, by cultivating other products which were then largely imported, use their lands to much greater advantage. One of the recommendations of the Commission to the Government was as follows:—

> "(*a*) A judicious system of offering bonuses 'for the production of new vegetable products, &c., and (*b*) the granting of bonuses for the establishment of factories for transforming the raw material into the manufactured article.'"

Evidence was adduced by some of the witnesses which told of efforts to establish an export trade in butter in this and other States. Although the results were not successful in every case, they were sufficiently encouraging to induce the Government of the day to offer financial assistance towards the development of the trade. Bonuses were offered, and this incentive, together with the unprofitable condition of the

farmers' labour at the time, gave a stimulus to the erection of butter factories for the conversion of milk into butter for export to London. The germ of co-operation, having been introduced from the sister State of New South Wales, where it had already given evidence of some vitality, now sprang into active life in this State, resulting in the formation of organizations of farmers for the purpose of building and equipping factories for the manufacture of butter. The Cobden and District Co-operative Pioneer Company Limited, established in 1888, holds the honour of being the first co-operative butter factory to commence operations in Victoria. In the eighties this factory was not unnaturally a very primitive one, and it is nowadays a theme of absorbing interest to the original shareholders to recall the wonderful difference between that comparatively unpretentious structure consisting of one room, and the splendid, modern, and magnificently-equipped factory of to-day. The original capital of this company was £2,000, and the late Rev. H. R. Foster was the first shareholder.

In the year 1891 the sum of £2,235 was paid for milk, and in 1899 £26,816 was distributed amongst suppliers. Last year (1913), the total amount disbursed was £58,347. During the past twenty-two years of the company's existence, the sum of £817,659 has been paid for milk and cream, and a further distribution of £32,627 made in the shape of bonuses and dividends. In addition, £19,107 has been written off for depreciation. The value of land, plant, and machinery is set down at £7,645.

The Pioneer Company has erected several creamery or separating stations for the convenience of producers, and in the most inaccessible locality has erected a cheese factory. The produce of this company's manufacture holds a very high reputation on the London and local markets.

A few weeks later another butter factory was opened at Warrnambool, and early in the following year co-operative factories began operations in Koroit, Macorna, Thoona, and Tungamah. The superior quality of the butter produced by the factory method, and the greater uniformity achieved in comparison with individual buttermaking were such as to place the success of the system beyond doubt. This co-operation amongst producers led to better relations, and the mutual advancement of the members. As far as the manufacture of butter was concerned, co-operation was now fairly established, but not even the most optimistic had any conception of the enormous expansion that was destined to take place in the manufacture of this commodity, or the magnitude of the capital that co-operative manufacturing concerns would eventually represent.

The objects of these co-operative societies, as shown in the articles of association, were for the manufacture of butter and cheese.

The liability of the members was limited.

The nominal capital was fixed in accordance with the views of the promoters, and was divided into £1 shares.

Another proposal in the prospectus of one of these companies was "That after paying all working expenses, and a bonus to shareholders not to exceed, say, £10 per cent. on the amount subscribed on their shares, that this company shall be worked on a co-operative system, by which means every person who supplies milk to the factory, besides being paid for it at a highly remunerative rate, will participate in the profits of the

company in proportion to the quantity of milk he supplies. So that, assuming the company to be successful, any one becoming a shareholder may receive 10 per cent. on his actual outlay in shares, can sell his milk at a good price, and at the same time have a share in the profits under the co-operative system."

Strange as it may appear, many of the early shareholders in these farmers' co-operative concerns were storekeepers, professional men, and clergymen. The farmers themselves were shy of taking up shares. An experience related to the writer by one of the early organizers of this co-operative movement, is worth repeating. The provisional directors of a certain proposed company were called together to receive a report of progress. The chairman urged those present who had not already taken up shares, to do so, and those who had shares, to increase their holding. He further stated it was important that the first call of 1s. per share should be paid up, so as to enable the promoters to register the company. One inquiring prospective shareholder asked if the chairman of directors had paid his application fee. Whilst the latter gentleman was pondering over his reply, the secretary saved the situation by a tactful evasion of the actual truth. Immediately after the meeting, and before those present had dispersed, the secretary commandeered the chairman's cheque, which he held up for the edification of all concerned. This practical evidence of the chairman's confidence proved the turning point in the history of the establishment, which now has a share list of 700 persons, representing £5,697 in subscribed capital. The first issue of shares numbered 2,000; promises were received for 690, but on the date of the closing of the issue only twenty-five shares had been actually applied for, the applicant being a clergyman from a neighbouring township. The secretary's diplomacy, and the chairman's example, however, inspired the confidence of the producers, and this company has had a most prosperous career.

Credit for the inauguration of many of the successful co-operative concerns now in existence is due largely to the interest shown in them by non-producers, many of whom became directors of the various companies, and gave their services free of charge.

During the earlier history of this movement many of these societies' operations were conducted on a limited scale, and the finances were not in too flourishing a condition, so that it was no uncommon thing for the dry shareholders, as they were called, actually to refuse acceptance of dividends from the scanty profits, preferring that the money should be invested in the better equipment of the factory, and the balance, if any, refunded to the producers in the shape of bonuses on the milk supplied.

The success of these formers' undertakings may be attributed to the fact that their operations were restricted to the manufacture of butter or cheese. It was not until many years later than the purchase of supplies and the distribution of stores were attempted. These activities will be dealt with later.

There are now in this State nearly 100 co-operative butter factories, representing a subscribed capital, actually paid up, of £225,673, and of the total butter produced in Victoria, about 70 per cent. is manufactured by these companies. The value of plant, buildings (after rigid writing down for depreciation), and land, represents a sum of £370,213. Most of these societies are in a sound financial position, as is evidenced by a glance at

the balance-sheet of three of the largest companies. The subscribed capital of these companies amounts to £17,097, whilst the combined assets represent £57,157.

The Colac Co-operative Dairying Company, which is one of the largest in the State, commenced operations in the year 1892. The turnover for the first year was only £2,149, whilst for the year just closed it was £208,237. The total amount of money distributed amongst producers since the inception of the company amounted to £2,077,982, and an additional sum of £29,084, representing profits, has been paid back in the shape of dividends on shares and bonuses on produce supplied. £24,188 has been written off for depreciation, and the assets of the company stand to-day at £23,737, whilst the paid-up capital is £6,435. A glance at these figures should convince the most sceptical of the benefits of co-operative effort when applied to specific industries. It should be remembered that the prices paid for the raw product were invariably based on market quotations, which were always kept at the highest possible level consistent with successful business management. No doubt, if this industry had been left in the hands of private enterprise, without the competition resulting from the farmers' own establishments, prices to producers would not have been maintained at the same high values. Under such circumstances, the sum of £30,000 shown does not represent the full value of the benefits derived.

The Camperdown Cheese and Butter Factory Company Limited is surrounded by some of the richest and most fertile land in the State. Twenty years ago dairying was conducted on a limited scale in this district, and the methods employed were primitive. Other varieties of farm produce were selling at prices which left little or no profit to producers, so that it was decided to form a co-operative company for the manufacture of cheese and butter. Many of the large land-holders took an active interest in the proposition, and subscribed largely to the share capital. It may be mentioned that the occupation of these large landowners was at the time chiefly confined to wool-growing or grazing for the production of meat. It very soon became evident to them, however, that dairying offered a more remunerative return from their lands. To their credit it must be said that these land-owners made farms available on most advantageous terms to tenants. The rents were reasonable, and the leases of long duration. Substantial concessions were made regarding the erection of dwellings and improvements. During the currency of these leases the landlords gave the tenants the option of acquiring their own farms by purchase, and the same liberality was extended in regard to the payment of the purchase money. This generous treatment in the past by the owners has been responsible for the existence in that district to-day of a thriving and prosperous farming community. It also gave the necessary stimulus to the co-operative butter factory which had just about that time commenced operations. The following data regarding the progress of this company should prove of interest:—

Year ended	Paid for Milk and Cream. £	Profits earned. £
1892	912	166
1894	9,263	1,906
1900	55,802	3,765
1907	77,528	1,753
1913	117,917	1,759

Since the inception of the company a sum of £1,250,000 has been paid to producers for milk and cream, and the total profits earned amount to £55,685. The net profit for the year 1913 was dealt with as follows:—

Dividend on 5,697 shares at 7 per cent...	£398	15	9
Bonus ¼d. per lb. on butter fat from qualified shareholders	750	0	0
Write off 2½ per cent., amount allowed by Income Tax Commissioner on plant	105	18	0
Write off plant factory	505	5	1
Total	£1,759	18	10

A wise precaution has been adopted throughout in connexion with co-operative associations by writing down large sums for depreciation.

In 1888 a movement was set afoot in the district of Koroit, having for its object the formation of a co-operative company to undertake the manufacture of butter. Four thousand £1 shares were placed on the market, and subscribed for by local farmers, business, and professional men. The total paid-up capital of the company at the end of the first year's operations was £1,723. The cost of land, buildings, and plant amounted to £1,963. The amount of milk purchased during the first year cost £697, and the year's operations resulted in a loss of £96. The financial position of the company at this stage looked serious, and the directors were requested to give their personal security, jointly and severally, to the bank. During the following year the supplies of milk increased tenfold, and a substantial profit was shown as the result of the year's transactions. From that time progress was more rapid. Confidence in the production of butter as a profitable occupation was firmly established, and, owing to the fact that the surplus found a ready market in London, dairying became the primary industry in this rich and fertile district. During the period of this company's existence a sum of £758,379 has been received for butter manufactured; the profit on this output amounted to £29,403; £12,270 was distributed in bonuses and dividends, and £6,176 was written off for depreciation.

Prior to the establishment of the butter factory the land in this district was devoted to the growing of cereals and root crops, but owing, as previously stated, to the low prices ruling for these products their cultivation proved unprofitable. An idea of the value of this land may be gleaned from the fact that good farms had changed hands at prices ranging from £30 to £50 per acre. One would imagine that such highly-priced land could not be profitably devoted to dairying. It is a fact, however, that land values, instead of decreasing, gradually appreciated, and the writer has known farms to have been sold recently up to £100 per acre. These holdings are chiefly mixed farms, and dairying plays an important part in their rotation system.

Extending the Co-operative Principle to other Products.

Poultry-raising, being an adjunct to dairying, lent itself readily to the principle of co-operation. The central butter factories and branch creameries were used as depôts for the collection of eggs. These goods were collected daily, and despatched to the market in a condition that enabled producers to obtain top market rates and dispense with the services of the costly middleman.

Several of the larger factories are now entering into competition with local storekeepers in the supplying of goods and requisites to their shareholders. This action is looked upon by private business firms as poaching upon their rights, but it is a perfectly legitimate movement, and tends to bring co-operation to its logical goal. The practice of these co-operative companies is to purchase from wholesale business firms in large quantities such supplies as are required by their members, and, after allowing a reasonable sum to cover the cost of rail transit and working expenses, to retail the goods at cost price. This, of course, eliminates the middleman, and saves his profit to the consumers.

The co-operative spirit seems to be gradually extending, more particularly in the backward and less populous parts of the State. Waggons (horse-drawn and motor) are sent out from these large central factories to collect the cream and eggs of the producer, and bring them in to the central factory. The driver takes orders for goods required by the farmers, and delivers them per medium of his waggon on his next visit,—thus saving the farmer, in the first place, the cost of delivering his produce to the factory, and, in the second place, the necessity of visiting the town in order to purchase supplies. The system is linking up the whole of the activities of the farmer, so that he becomes eventually self-contained. He supplies his produce to his own factory, the profits of which he participates in; he purchases his goods and requirements from his own store, which is controlled by the same body, and the profits, if any, he shares also.

(To be continued.)

CABRO BEAN TREE (CERATONIA SILIQUA).

"From our observations in the East," writes Dr. De Hass, "we are inclined to believe that the 'locusts and wild honey' referred to as the diet of John the Baptist, were the fruit of the carob tree, and the 'dibs' of honey extracted therefrom. The popular name for this tree in Palestine is the 'locust,' and the fruit is known everywhere as the 'bread of St. John.' In Arabia it is called carob, from the horn-like shape of its pods or fruit. These pods are sometimes called 'husks,' and, without doubt, are the 'husks' the prodigal in his distress would fain have eaten. This tree is found all over Palestine. It is a dark evergreen, with heavy foliage, affording a delightful shade, and bears a crescent-shaped bean, about 6 inches long and 1 inch wide. The fruit is fed to horses, cattle, and swine. The trees are generally registered; property in them is capital, and marriage portions are frequently given in locusts, or the fruit of the carob. The fruit, when ripe, contains a sweet pulp, which is compressed and made into honey, called 'dibs,' which is the honey in general use among the peasantry of Palestine."

POTATO CULTURE.

By J. T. Ramsay, Potato Expert.

There can be no question that the cultivation of the potato as a field crop ranks as one of the most important branches of agriculture. Since its introduction into the economy of the farm, it has steadily grown in favour throughout the world, until, to-day, it occupies the position of one of the staple foods, and its cultivation, more particularly in Europe, is even followed to provide raw material for the manufacture of flour, spirit, and starch. As a staple food its importance is obvious when one considers that it is regarded almost as an essential. Its comparative cheapness makes it available to all classes, and the beneficial effect which its proper cultivation has on the soils in which it is grown, renders it a crop of great importance to farmers practising in districts climatically suitable for its cultivation.

The importance of the crop, then, being palpable, it is not only fitting, but a demand of moment that every effort be put forth to bring its cultivation and production up to the highest standard, and it is not saying too much to give expression to the opinion that if growers were to give more special attention to cropping potatoes, they would find an accompanying increase in the yield of the other crops grown in rotation. This is so because the potato crop, more than most others, demands a high standard of farming and more constant tillage, if the best results are to be obtained, and crops grown in rotation with it benefit from this intense cultivation. Further, it must be admitted that when one finds a farmer who is a consistently successful potato grower, one is sure to find in him a farmer whose every crop is treated in such a way as to ensure, as far as is possible, the heaviest yields, and in whose system of farming there is little left to chance.

Conditions in Victoria.

In Victoria there is a vast area of land which is so conditioned, as regards soil and climate, as to be suitable for the profitable production of potatoes. The potato may be grown on practically any soil short of heavy clay; the ideal soils being those varying between sandy and loam. The need of the crop for a good and fairly even condition of moisture during the growing period precludes the growth of good paying yields of it (in the average season) in the drier portions of the State, where no irrigation is practised, but the average rainfall of nearly the whole of the southern and eastern portions is ample, and suitably distributed throughout the year, for its profitable production.

At present the average yield per acre for the State is approximately three tons, and this low tonnage, as compared with that of other countries, is undoubtedly due in very large part to the haphazard methods followed by many growers in dealing with the crop.

In the cultivation of potatoes there are three factors within the control of the farmer, the correct states of which are necessary for the best yields. These three are:—

1. Condition of the Seed.
2. Physical Condition of the Soil.
3. Plant Food in the Soil.

These factors are all important. The abundance of plant food, and the perfect condition of the seed, will not produce a full crop if the *physical condition of the soil be bad; and, similarly, a low standard of* fertility of the soil, or of the vigour of the seed, will give a disappointing return, even though the other two factors be correctly adjusted.

Degeneration of Varieties Preventable.

Regarding the Condition of the Seed.—The varieties of potatoes on the world's markets are, in the name at least, legion, and year by year the number of these is being added to by propagators, who are diligently and continually seeking after new sorts, which, it is hoped, will eclipse the records of current or past varieties, and bring their propagators fame and fortune. What becomes of all these varieties? Why is it that, after a comparatively short period, the prolificacy of the majority of them degenerates to a level at which their cultivation becomes unprofitable, or, as it is popularly termed, "run out"? Many growers

Fig. 1.—Three-row Horse Cultivator, capable of hoeing up to 15 acres per day.

are ever anxious to get hold of new sorts, and keenly buy up any variety produced which gives promise of profit by virtue of its having, in an outstanding degree, one or more of the features which make a potato desirable from the cultivator's point of view, viz., earliness in maturing, good cooking quality, strong disease-resistant power, and productiveness. But no sooner do the majority of growers procure a new variety worthy of attention than they, by their treatment of it, proceed to "run it out" with all possible speed. Now there is no reason why any good variety of potato should not remain in cultivation as long as growers remain to cultivate it. Once a farmer secures a variety that suits his local conditions, he should so treat it that it will not only *not* "run out," but will rather tend to improve as time goes on.

The length of time any particular kind of potato remains in profitable cultivation is governed by two things, viz., by the treatment it receives, and by its vigour at the time of its introduction. Some varieties are more vigorous than others when produced from the seed-berry of the potato plant, and can consequently stand more adverse treatment before falling into a condition of low productiveness, than can those of less vigour. But no matter how vigorous any variety may be, it cannot withstand the degenerative influence of bad, or unselected seed. Breeders *of good stock aim at reproducing only from the best types available to* them, and if continual selection of the best for breeding from were not made, degeneration would quickly follow. Growers of plants are under the same law. Like—for the greater part—produces like. Yet, notwithstanding this admitted fact, one often finds potatoes being taken for seed which would be more profitably used as stock food. When poor conditioned seed is employed to grow any crop, that crop is so handicapped that its finish will be disappointing; and at the present time it is safe to say that a very large proportion of the crops grown in the State starts with seed of impaired vitality. To illustrate that this is not an exaggerated statement, it is only necessary to review briefly the common practice amongst growers.

Indiscriminate Selection of Seed the Rule.

Ordinarily potatoes are allowed to ripen in the ground before being dug, and the seed for the following season is selected either from the crop after it has been bulked, or from the rejects from the marketable tubers. After this "selection" has been made, the seed is generally stored in any place where it can be conveniently disposed of, in heaps, bagged or unbagged, and is often forgotten until such time as it is required for planting, with the result that by that time the potatoes intended for seed are a mass of long, delicate white shoots, many of which are broken off in the handling incidental to planting, and in *many cases the remaining sprouts are carefully and deliberately* removed by the growers. The object of the growers in breaking off the balance is, of course, to prevent the irregular appearance of the crop above the ground, and with such an object in view, the practice of desprouting serves its purpose, but the seed suffers.

Effect of Indiscriminate Selection.

Where such methods as just described are followed, it is evident that the best seed cannot be secured, for the simple reason that, after the produce of a field of potatoes has been bulked, it is an absolute impossibility to discriminate with certainty between the produce of strong growing, prolific plants and that of weak plants. For economical reasons, small sized tubers, *i.e.*, tubers under the size marketed for table use, are *often taken for seed potatoes*, and *there is no objection to the* use of small sized seed provided proper selection of it is made. The necessity for selection becomes apparent when it is pointed out that there are two classes of small potatoes. First, there are those which are small on account of some weakness of the parent plants; and second, those which are the later formed tubers of strong plants which have not had time to mature. As it is impossible to separate these two classes

when once they are mixed, it follows that, if selection is made of seed after the bulking of the crop, there is the certainty that the seed parcel will contain a yearly increasing percentage of the produce of plants of low yielding power, with the result that the particular variety being so treated will give progressively diminishing returns, until it becomes entirely unprofitable, or "run out." Even where large sized seed is used, and selection made from bulk, there is (to a lesser extent certainly) the same risk of inclusion among the seed of the produce of weak plants, as very often a weak plant will give only one or two tubers, yet these may be of fair size.

Method of Maintaining Productiveness.

There is but one method by which potatoes may be selected for seed, so that the standard of trueness to type and yielding capacity may be maintained unimpaired, and that is, by selecting the seed intended for the following season's planting out of the field crop while the crop is green and growing. Seed selected in this way can be chosen from the most desirable plants, *i.e.*, those plants which are healthiest, most vigorous, and producing the greatest number of marketable sized tubers. It stands to reason that seed selected from such stock must produce plants of more vigour than seed taken promiscuously from a heap where fit and unfit are mixed. At no time other than when the plants are growing can this rigorous selection of the most likely to be fit be made.

Stud Plots for Large Growers.

The average grower of any quantity of potatoes may be inclined to think that this care entails more trouble and cost than the crop is worth, but it is not so. For those who plant large acreages each year, and who, therefore, require many tons of seed, the work of selecting can be carried out in the following manner:—Suppose a grower plants 50 acres of potatoes yearly; that in normal seasons he gets five tons per acre, and that he wishes to select his seed with a view to improving his stock. At the rate of sowing of 12 cwt. per acre, it takes 30 tons to plant 50 acres. Now six acres of crop, at five tons to the acre, gives 30 tons, therefore, if sufficient seed for six acres, viz., 3 tons 12 cwt., were rigidly selected each year, and a six-acre area planted with them, the grower would then have yearly a stud plot producing tubers of a high standard sufficient to plant the whole of his 50 acres. The rate of planting has been, for the purpose of illustration, taken as 12 cwt. per acre, but this may vary according to the size and the spacing of the sets. The probability is that the rate of production of the stud plot, too, will vary, and be nearer to 10 tons, on the average, than the five tons mentioned in the calculation.

Immature Seed Increase Tonnage per Acre.

In harvesting such a seed plot, or in harvesting any potatoes intended for seed, care should be taken to dig the tubers out of the ground before they are matured. As a rule, the seeds of plants require to be thoroughly ripened before they are best able to reproduce their kind, and it may be asked why the potato should differ. The answer is that potato seed, as commonly known and termed, is not the true seed of the potato plant. The true seed of the plant is contained in the berry, or "apple," which is produced above ground. The potato seed used for planting is merely

a section of the previous season's plant, and is, therefore, really a cutting, and not a seed. The improvement in the yield from immature seed, as compared with ripe seed, has been so long and clearly demonstrated, that the practice of securing seed that has been dug before the ripening of the plants has been, for some time, thoroughly established in certain districts where a specialty is made of potato culture.

On the average, the increase in the crop resulting is from one and a half to two tons per acre, and when it is remembered that the average yield for the State is about three tons per acre under methods at present employed, the profit awaiting farmers who will adopt this more up-to-date practice must be admitted to be well worth the little extra trouble involved.

Storage of Seed.

It is important that the seed, when selected, be stored in such a way as will keep it in sound condition until planting time, and the best method of doing this is to thoroughly green it and store it so that it will have an abundance of ventilation. The greening is effected by exposure to light, which toughens and turns green in colour the outer portion of the tubers. Well greened seed is an ideal condition for keeping. Abundance of ventilation is secured by storing the tubers at a very shallow depth, by spreading them out thinly on the ground, or on the floor of a shed, or by placing them in special seed-potato boxes. A description of these seed-boxes, and their cost, was given in the *Journal of Agriculture* for February, 1914, and an illustration is given in this number of the boxes filled and stacked.

Effect on Seed of Various Storage Methods.

The effect on the seed of storage in any of these ways is similar, but the use of the boxes is recommended, for the following reasons:—(1) Space is economized; (2) the seed may be inspected and moved with convenience; (3) the seed is more easily protected from frost, insects, or stock; and (4) less handling of the seed is entailed.

When seed is stored in pits or heaps, the potatoes cannot be conveniently examined from time to time; the sprouting cannot be regulated, and the sprouted potatoes cannot be handled from the heaps or pits without injuring a great number of the shoots, and thereby adversely affecting the sets. Where seed is stored in boxes, the sprouting can be regulated by the admission or the exclusion of light, and the tubers can be carted to the paddock and planted without damage to the sprouts.

Benefits of Boxing and Sprouting the Seed.

If potatoes are stored in seed-boxes directly after digging, and therefore kept well ventilated, in the majority of cases only one shoot will grow from the terminal bud of each tuber; whereas, if stored in pits or heaps, shoots will grow from almost every eye in the pile. The crop resulting from a potato planted whole, with only one eye sprouted, will give a heavier yield of marketable-sized tubers per acre than will a potato of similar size which has shoots at every eye. Seed sprouted nicely before planting will be ready for digging in several weeks less time than will unsprouted seed, and it, therefore, runs so much less risk of attack by disease.

Further, when seed has sent forth a shoot prior to being placed in the ground, the grower can see clearly the vigour or weakness of each individual tuber, and can, therefore, with certainty, evade planting sets which would produce weak plants; and, if for no other reason than that, the boxing and sprouting of seed potatoes should be practised, as it is the "misses" and the weak plants which reduce the yield in tons per acre.

Regarding the Physical Condition of the Soil.—The potato crop demands, if it is to thrive, soil that is well drained, either naturally or artificially; free working, and of fair depth. The range of soils between sandy and loam are the most suitable in which to grow the crop, as on account of their texture, they are more easily, and therefore, cheaply, cultivated into the necessary tilth, than are the heavier clay soils, and they are not liable to become set and unkind. The freer the condition of the soil the more perfect is the shape of the tubers to their type,

Fig. 2.—Planting Sprouted Seed from Boxes, Scotland.

as is instanced by the uniformly good formation of potatoes grown in soils of light sandy character, for in soils of that class the tubers develop without restriction. The crop can be, and is, grown on heavy clay land, but good crops are obtainable in clay soils only by the application of heavy dressings of organic manures and by frequent and perfect tillage. Ordinarily it is not advisable to attempt to grow them on heavy clay soils.

New or Old Land for the Crop?

There is an idea in the minds of many farmers that new land only is suitable for potato-growing, but that is incorrect. A statement to that effect should be modified to give expression to the fact that the best results are obtained by some farmers in new ground, because the land is so farmed that after the first year or two it is never again in the proper physical condition to favour or permit a heavy yield being grown.

New land is, as a rule, permeated by a mass of rootlets of grass and other plants, which, when the land is broken up, act helpfully towards the succeeding crop physically by keeping the soil open and by conserving moisture, and chemically by supplying plant food. Such being the physical condition of virgin soil, and the fact that the potato crop thrives so well under such conditions, clearly indicates that the environment is congenial to it, therefore it is but stating the obvious to say that if good crops are to be the rule, the conditions prevailing when virgin soil is first broken up should be aimed at when preparing older worked land for the crop, and that can only be done by adding organic matter to the soil from time to time.

Importance of Organic Matter in the Soil.

Vegetable matter is the best giver and preserver of good physical condition in soil, and it should be borne in mind that the need of it is *greatest where it is most difficult to retain it.* In a climate such as we have in Victoria, where it is customary to experience long spells of dry, hot weather, it is only by the observance of good farm practice that the vegetable matter, or humus content of soil, can be saved from incineration, and maintained at an appreciably beneficial standard. Under the system followed by many at the present time, each succeeding year sees a depreciation both in the fertility and the mechanical condition of their soils that are under cultivation. Indeed, one often hears of land that is said to be incapable now of producing as heavy crops as it once did, and of land which is said to be quite worked out.

Land which will not grow as heavy crops as ever it did is land which has been maltreated in the farming. The tendency has been to take all possible out of the soil, without consideration for the future, with the common result that the humus content has been gradually reduced, until in many cases a state bordering on its absolute depletion has been reached, and the soil thereby rendered difficult to work and uncongenial to crops—particularly potato crops. A system of robbing the land such as that may yield payable returns for a short period; but, if farming is to continue to pay, the effort of the farmer should be towards improving the condition of his soil from year to year.

Rotation of Crops.

It is the greatest possible mistake to allow land to become run down before attempting to check the depreciation, and if a proper system of farming, viz., the rotation of crops, periodic green manuring and catch-cropping, is followed, the impairment of the physical state of soils can be prevented. In the older farmed countries of the world, a profitable physical condition of their farmed lands has been maintained only by the application of large quantities of organic matter, and though the opinion is held by some that it is too soon, in a young country like this, where the land has been cultivated for a comparatively short period, to talk of improving soils, it is nevertheless a fact that, if the productiveness of our lands is to be increased, or even maintained, that same procedure, viz., ploughing down vegetable matter, must be followed here, in order that the physical condition of soil necessary for the free development of plants may be secured.

The incorporation of a plentiful supply of organic manure with the soil increases its capacity for the absorption and retention of moisture, thus providing a more regular supply for the wants of the potato crop during the growing period, and a consequent lessening of the risk of second growth.

Regarding Plant Food in the Soil.—An intelligent system of manuring is the means of regulating plant food available for crops, and it is safe to say that there are none of the soils in the potato-growing districts which would not be benefited by the application of manure in some form.

In the composition of any farm crop there is combined a number of elements which are essential, and in all soils that are at all fertile, these constituents are present in quantities ample for the requirements of crops, with the exception of four, one or more of which need to be applied. These four are:—Nitrogen, Potash, Phosphoric Acid, and Lime.

Digging by Machine, Scotland.

Lime, though not generally looked upon as a manure, is included because of its highly beneficial effect on soils, helping, as it does, to render more friable the heavy lands, and because it acts as a liberator of plant food in the soil. It is an essential element in the food of plants, too; and though in most fertile soils it is generally present in sufficient quantity to supply the actual food requirements of the crop, there is frequently an insufficiency of it to promote the good physical condition and consequent chemical and bacterial activity necessary for free growth.

There are two ways by which plant food may be increased in the soil—

1. By applying organic matter as green manure or yard manure;
2. By applying chemical manures (inorganic for the most part).

By using green, or yard, manure not only is there complete manure (*i.e.*, *a manure containing all the necessary constituents for the growth of crops*) added to the soil; but the fact that it is put on in the form of vegetable matter is of very considerable importance, inasmuch as the plant food is built up, and the mechanical condition of the soil improved, at the same time. Inorganic chemical manures supply plant food either direct or in an easily convertible form, without adding to the humus content. This difference between natural and artificial manures can be appreciated in view of what has been written regarding the importance of a good physical condition.

Green *v.* Yard Manure.

Owing to the fact that continuous housing of stock during the winter is not practised to any extent in the State, farm-yard manure—except to those in close proximity to large towns—is not available for application to land in quantities sufficient to dress large areas, so that where humus is deficient, reliance must be placed on ploughing in green manure. Green manure—that is, green crops, such as peas, rape, mustard, rye, &c.—is preferable to yard manure, for these reasons:—(1) It is freer from weeds; (2) it entails much less labour in application; and (3) it is, all things considered, cheaper. Yard manure, except when care is taken to have it thoroughly rotted, is a plentiful source of supply of the seeds of weeds; whereas, when green crop is ploughed under, all weeds in the crop are turned down before they seed, and, besides being checked, are made of use.

When peas are grown for the purpose of manuring, they should be allowed to flower before they are ploughed in, as the fixation of nitrogen on their roots is often not appreciable before the flowering stage is reached. Mustard is a valuable catch-crop for cleaning and manuring land, but may become a pest if allowed to seed.

Even where a system of green manuring is adopted it will be found advantageous to use artificial manures to force a heavy growth, both of the green and the succeeding crop.

Determination of Chemical Manures to be Used.

Actually what particular chemical manures to apply, and what quantities per acre will be required, are points which must be decided by each individual grower by experiment on his own particular soil and by close observation.

The production of heavy crops of anything would be a very simple matter if an all-sufficient formula of manure could be stated; but the varying chemical compositions of soils, variations of which will often be found to occur abruptly in the same paddock, make it impossible for any standard manure to be given which would be equally efficacious, and at the same time economical, in all classes of soils. If an analysis of any soil be obtained, this will form a guide as to what manures it will be advisable to try, as from the analysis one can see whether there is any marked deficiency of any of the essentials, and can thereupon manure to rectify, according to the requirements of the various crops.

Generally Used Forms of Artificial Manures.

There is a variety of forms in which the four main constituents referred to may be applied artificially, and the most common forms obtainable on the Melbourne market are:—

- Nitrogen, as—
  - Sulphate of ammonia.
  - Blood manure.
  - Nitrate of soda.
- Potash, as—
  - Sulphate of potash.
  - Muriate, or chloride of potash.
  - Kainit.
- Phosphoric Acid, as—
  - Superphosphate.
  - Thomas' phosphate, or basic slag.
  - Bones.
- Lime, as—
  - Carbonate of lime.
  - Burnt lime.
  - Gypsum.

Best Forms of Artificial Manures to Use.

In using these for the growth of potato crops, experience has shown that there are certain of these forms more suitable than others. Nitrogen is best applied in the form of blood manure, or sulphate of ammonia, and is less liable to be lost by leaching than when applied as nitrate of soda, and should be applied at the time of planting. If applied as a top dressing, sulphate of ammonia may be sown broadcast when the crop comes through the ground, and harrowed in.

Potash should not be applied in any other form than as potash sulphate, muriate of potash, and kainit, while increasing the tonnage per acre, equally with sulphate of potash, have a most deleterious effect on the quality of the tubers.

The soils of the State are apparently well supplied with potash, but as this is the dominant ingredient of a balanced manure for potatoes (and for leguminous plants), it will be found that an application of it will often result in an increased crop, even in soil apparently sufficiently supplied with it. Potash sulphate may be applied either in the autumn or at time of planting. Phosphoric acid is best applied as superphosphate, and Thomas' phosphate in the proportion of two parts of the first to one part of the latter.

When superphosphate is used alone, there is a tendency towards a shortening of the growing period of the crop, and consequent increase in the percentage of small tubers, particularly where the soil is deficient in potash.

Lime may be applied as carbonate of lime (ground limestone) or as burnt lime, and should be applied in the autumn, especially when burnt lime is used.

Rates of Application.

The rates at which these manures may be sown varies, as previously stated, with the class and condition of soil; but for average circumstances

a trial could be made with 2 cwt. superphosphate, 1 cwt. Thomas' phosphate, 1 cwt. sulphate of potash, and 1 cwt. sulphate of ammonia: *and variations of this dressing, both as to quantity and composition, could* be tested on different sections to ascertain particular local knowledge of the effectiveness of each, and to determine the most economical proportions and rate of sowing, on the particular land being treated.

The conversion of farmers to a more general and more liberal use of artificial fertilizers is a thing somewhat slow of accomplishment, but year by year the number using these, and the quantities being applied per acre, are increasing, as the benefit from their employment is becoming more widely recognised.

If there ever was a time when the soils of the State would stand the strain of cropping year in and year out, without replenishment of plant food, that time is past, and the sooner this fact is realized by farmers, the sooner will their lands approach the standard of productiveness which has been maintained for centuries in countries where the conditions are such that the maximum return from every acre must be striven for if the farmer is to remain in the business of farming.

Profits from the Use of Artificial Manures.

As an illustration of the profit with which manures may be used, the result of an experimental plot, at Port Fairy, is given. The plot was planted on November 24th, 1913, and harvested on April 28th, 1914. The table shows the results obtained:—

Manuring.	No Manure.	2 Superphosphate, 1 Sulphate of Potash.	1 Sulphate of Potash.	2 Superphosphate.	2 Thomas' Phosphate, 1½ Sulphate of Potash.
	Tons. cwt. lbs.	Tons. cwt. lbs.	Tons. cwt. lbs.	Tons. cwt. lbs.	Tons. cwt. lbs.
Marketable	2 15 50	4 9 22	4 13 84	1 18 84	7 2 86
Small	0 14 32	0 12 6	0 10 0	1 3 4	0 10 20
Total weight per acre ..	3 0 82	5 1 28	5 3 84	3 1 88	7 12 106
Percentage of small tubers ..	**20·3%**	**11·7%**	**9·7%**	**37·2%**	**7·1%**
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cost of manure	Nil	1 3 6	0 14 6	0 9 0	1 10 0
		Tons. cwt. lbs.	**Tons. cwt. lbs.**	**Tons. cwt. lbs.**	**Tons. cwt. lbs.**
Increase due to manure ..	..	**1 11 58**	**1 14 2**	***0 7 106**	**4 [illegible] 24**

* Decrease.

The class of soil on which this test was conducted was old peat, which, on analysis, was shown to be deficient in potash and phosphoric acid, and rich in lime and nitrogen.

The season was a dry one, and this, no doubt, accentuated the tendency of the superphosphate, when applied alone, towards early maturation, and accounts in part for the fact that Section 4 gave actually less weight per acre than the plot treated with no manure. A feature worthy of notice is the low percentage of small-sized tubers on the plots which received potasic manures. The increased return resulting directly from the manuring of Section 5, as compared with Section 1 (no manure), calculated at the rate of £4 per ton (which is a fair average of this season's prices), amounts to £16 12s. per acre, which, after deducting cost of manure, leaves the handsome profit of fully £15 per acre.

Cultivation.

In outlining the cultural operations by which the crop may be prepared for, planted, tended, and harvested in good condition, there is difficulty in stating a hard-and-fast method which would be suitable to all cases, on account of the widely varying conditions of soil and climate under which the potato is cultivated in different portions of the State. The object to be aimed at in preparatory cultivation is to produce a good mechanical condition of the soil for the reception of the seed, as much of the success of the crop depends on the state of the land at the time of planting. When potatoes follow green crop or grass these may be plowed down on top of the seed, and the land worked down afterwards by disc or spring-tooth cultivator and harrows, as where there is a good body of green stuff, the presence of this in the soil produces the desirable condition. Care should be taken when this method is followed that the implements used in pulverizing the surface after planting do not penetrate deeply enough to damage or disturb the seed. When stubble land is being planted, the preparation of the ground should be commenced in the late autumn.

Application of Yard Manure.

Where stable manure is available this may profitably be applied at this time, and in order to insure the greatest benefit the manure should be turned over once or twice during the time it has been accumulating to assist the process of rotting and prevent overheating. To facilitate distribution, and to enable an even dressing of yard manure to be given over all of the portion to be manured, the land may be marked off in parallel lines six yards apart. These lines are made by the simple procedure of drawing light furrows with a single-furrow plow, distanced 18 feet between them, and running the whole length of the paddock. These furrows serve as tracks along which the horse drawing the manure-laden dray may walk, stopping and starting as directed by the driver. If the manure is placed in heaps spaced five yards apart along these furrows, then (6 yards by 5 yards equalling, approximately, 1 pole) 160 heaps will be required to cover an acre of ground, and the dray loads may be divided into whatever number of heaps are necessary for the rate per acre required, as, for instance, if it is wished to put on twenty loads per acre each load must be divided into eight heaps 5 yards apart, as twenty loads so distributed gives the 160 heaps required to cover an acre. Sixteen loads to the acre would mean ten heaps to the load, and so with other rates accordingly. By this simple practice the farmer may apply the yard manure more evenly than is generally done, and can calculate the rate of application instead of guessing it.

Stubble land, whether yard-manured or not, may be plowed the first time to a depth of, say, 4 or 5 inches, and a second and deeper plowing may be done during the winter months as opportunity offers. The second plowing assists in the thorough incorporation of the manure with the soil, and should, wherever practicable, be done across the direction of the first plowing.

Subsequent tillage should be given by cultivators to pulverize the furrows and reduce the soil to a good tilth before planting.

Planting—Depth and Spacing of Sets.

The planting of the sets on the flat, that is, by simply placing them in the furrow and plowing the soil on top of them, is preferable under average Victorian weather conditions to planting them in raised drills, as by the former plan there is less surface of soil exposed to the sun and air, and the evaporation of moisture from it is consequently less than when the land is hilled-up. Immediately after covering the sets with the plow, the ground should be harrowed to break down the furrows nicely, but it is not advisable to harrow it too finely at this stage, on account of the liability of very finely worked soil to set on the surface after rain. The work of planting large areas may be expeditiously and economically carried out by the use of planting machines of any of the various types now on the market. These machines open the furrow, deposit the sets at the required spaces, and cover them with soil all in one operation, and in most cases they are provided with an attachment for sowing chemical manure at varying rates at the same time. It is not

Pitting Potatoes, Scotland.

advisable, except on very light, sandy soils, which are liable to dry out quickly, to plant the sets at a greater depth than 4 to 4½ inches. The most convenient distance between the rows is 27 or 28 inches. Many growers make the drills 30 to 36 inches apart; but there is little doubt that 27-28-inch rows, together with rational feeding of the crop, produce the heaviest weights per acre. The spacing of the sets in the rows must be done according to the variety. Early sorts, having only small tops, may be planted at from 12 to 14 inches apart, but late varieties, most of which produce a heavy growth of haulm, need spacing at from 15 to 18 inches apart to prevent crowding.

Intercultivation.

The cultivation of the crop during the growing period should be frequent, so that weeds are kept down and the growth of the potatoes

assisted. Until the plants are well up through the ground, say 3 inches high, this may be effectively and cheaply done by harrowing, and the necessity for hand-hoeing eliminated, except on very dirty land. When the plants are too large to permit of the ground being harrowed without causing serious injury to the tubers, cultivation must be confined to working in the rows, and can be done by the use of a one, two, or three row horse hoe. The tines of the hoe should be set deeply, and as wide as is possible without damage to the plants during the first inter-cultivation. The tines should be narrowed down, and the working depth reduced to 1½ to 2 inches for later cultivation. These cultivations should be done as often as is necessary to keep the soil in a good, free condition.

Weeding out Wrong Varieties.

When the crop is intended to be used or sold for seed, the culling of plants not true to type should be done when the plants are in full bloom.

Hilling.

After the flowering stage is reached, and the tubers begin to form, the rows should be hilled-up so that the swelling tubers may be protected from the light and the attack of various pests by a covering of soil. Hilling should be so done that the soil raised by the hilling implement is deposited at the point where the young tubers are most likely to appear through the surface. This may easily be effected by narrow setting of the breasts of the hilling plow, so that a shoulder is put in the rows, the top of the drill being left fairly flat. The object of hilling, particularly in the case of narrow drills, is defeated if the rows are moulded up to a sharp point.

Harvesting the Crop.

Hand digging of potatoes is gradually being superseded by digging by machines designed for the purpose, and there are good reasons why this is so, as these machines have been so improved that at the present time they have an all-round advantage over hand digging. A good machine digger will raise potatoes quicker, damage fewer, leave less in the ground, and will dig them much cheaper than will men digging with forks. As a pulverizing cultivator, the machine digger has no equal amongst the whole collection of implements designed to assist the farmer in working the soil, and that being so, its use cannot but be beneficial to the succeeding crop. To a grower of 20 acres of potatoes the machine will pay for itself in a single season. A practice should be made of following hand or machine digging with the harrows, as these will expose to view any tubers which have been accidentally covered, and enable clean picking up to be done. Particulars of the various types of diggers are obtainable from implement manufacturers or their agents in Melbourne.

Pitting.

If it is desired to store potatoes for some time after digging prior to their being marketed for consumption, they should be pitted. Careful sorting to remove all diseased tubers should be done before placing them in the pits, and the site selected for their storage should have perfect drainage. A simple method of making a pit is to turn up by plow or

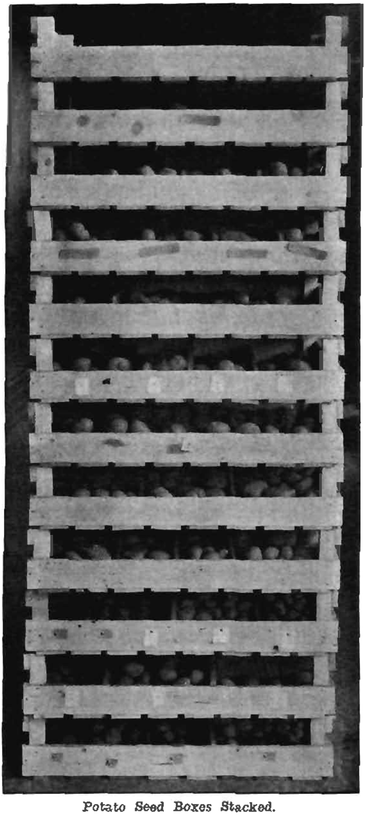
spade two furrows parallel to each other, with a space of 4 to 6 feet between them (inside measurement), the empty furrow space, of course, being on the outside of the pit. These up-turned furrows form the sides of the pit, and keep the potatoes up together; the ends may be made either circular or square. The narrower width of 4 feet is recommended for potatoes that are not lifted in the best of condition, but where these are ripe, sound, and dry, the wider measurement of 6 feet is quite safe. The sides of the pile should be built up as steeply as possible, so that the covering of straw necessary for protection from light may be assisted in shedding off rain. Should there be any risk of damage by frost, a light coating of soil may be placed over the straw, leaving the ridge of the pit uncovered for the ventilation which is essential for successful storage.

Grading for Market.

To expedite the work of grading potatoes into various sizes, and the removal of dirt and diseased or damaged tubers, a variety of more or less elaborate grading machines have been invented and placed on the market, in order that the tedious and expensive operation of hand picking from pits or other bulk storage might be eliminated. While some of these are fairly efficient where a nice, clean parcel has to be dealt with, it is doubtful whether they are more effective or economical in assisting the dressing of potatoes for market than hand-operated riddles, and they are certainly much more expensive at the outset. Hand riddles save much time in the work of grading, and their use should be adopted by any one growing even a single acre of potatoes. With hand riddles a gang of three persons can (according to the state of the potatoes) grade and bag from 10 to 15 tons per day from bulk. The manner of operating the riddles is simple, the first man shovels the potatoes from the pile into the riddle, using a blunt-edged thick-wire shovel to prevent cutting the tubers on the uneven bottom of the pit, the second man receives the potatoes on the riddle in such a manner as will save them from being bruised, this being accomplished by holding the riddle forward and retreating it as the potatoes are received into it, an action similar to that of a cricketer catching a ball. With a gentle shake of the riddle the tubers are spread over it evenly, and the dirt and small ones pass through the meshes. Any diseased potatoes amongst the remaining large tubers can then easily be detected and removed to a box or other receptacle. The prime potatoes left in the riddle are then tipped gently to one side and passed into a bag, which is held well opened at the mouth by the third person. The receiving of the tubers into the riddle, and the passing of them from the riddle of the bags, are arts which call for the exercise of some skill, but which can be mastered by careful practice. The small tubers are usually allowed to fall into a small mesh riddle with a rim of larger diameter than that on which the prime are graded, or, into an inclined race made of stout wires set sufficiently wide apart to allow dirt to fall through, but too narrow to give passage to the potatoes. These are received at the bottom of the race in a bag or basket, whence they are taken and stored for feed purposes.

The grading of potatoes for market is an operation which should be conscientiously carried out. The neglect to grade well, or the attempt to palm off inferior stuff, are certain to prove unprofitable, for the simple

reason that merchants, once bitten with such parcels, will steer clear of their sellers in future purchases. Growers should aim at sending their



Potato Seed Boxes Stacked.

potatoes to market in such condition that they would be prepared, and pleased, to publicly claim ownership.

PREVENTION OF LOSS BY DISEASE.

Considerable loss to growers is occasioned year after year from the damage done to the crop by various diseases, and at intervals these losses reach such serious proportions as to cause almost total ruin of the crop over extensive areas, as was the case during the season 1910-11, when Irish Blight ran riot at a heavy cost to those engaged in the potato industry. The diseases which are most commonly the cause of loss are, in popular terms, Irish Blight, Early Blight, and the various sources of scab, while amongst the insect pests the grub of the potato tuber moth is a formidable enemy to the crop. In view of (1) the immense damage which any one or more of these diseases may cause, (2) the fact that without microscopic examination their presence cannot in all cases be detected, and (3) the impossibility of foreseeing whether or not the season will be favorable for their development and spread—it is advisable that preventive measures be adopted.

From the results of investigations and experiments carried out by the Science Branches of this and other Departments of Agriculture, the following course of action is recommended to growers as an assurance against loss. First, potatoes as free from disease as it is possible to get them should be used for seed; secondly, seed should be dipped for two hours in a solution of corrosive sublimate of a strength of one ounce to six gallons of water before planting; thirdly, crops should be sprayed during the growing season. A spraying solution which has proved effective as a fungicide may be made from 2 lbs. sulphate of copper, 2½ lbs. washing soda to ten gallons of water, to which 1 ounce of paris green may be added as an insecticide. A full description of the method of making and using this mixture was published in the *Journal of Agriculture* of February, 1911, to which article those concerned are referred.

AUSTRALIAN WINES—BRITISH REQUIREMENTS.

By F. de Castella, Government Viticulturist.

A copy has been recently received from the Agent-General, of the usual return, prepared to an order of the House of Commons, in April last, showing the alcoholic strength, degree by degree, of wines imported in cask into the United Kingdom during the year 1913, consigned from the various countries of Europe, Australia, Madeira, &c.

The information given, more especialy concerning the nature of the wines we ship to the Mother Country, is so instructive that the following reproduction *in extenso* of the return will, no doubt, prove of general interest:—

STATEMENT showing the Quantity of Wine Imported in Cask, at the undermentioned Degrees of Alcoholic Strength, during the Year 1913, consigned from Spain, Portugal, Madeira, France, Germany, Netherlands, Italy, Australasia, and other Countries.

Countries whence Consigned.	8 Degrees and under.	9 Degrees.	10 Degrees.	11 Degrees.	12 Degrees.	13 Degrees.	14 Degrees.	15 Degrees.	16 Degrees.	17 Degrees.	18 Degrees.	19 Degrees.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Spain	54	..	41	58	162	108	54	540	483	1,144	10,239	28,480
Portugal	..	..	..	..	..	5	98	..	92	34	347	330
Madeira	..	..	..	..	..	..	..	..	..	..	..	..
France	383	92	319	363	446	2,812	9,789	25,724	102,253	191,459	274,969	288,510
Germany	498	135	453	19	103	992	6,252	44,595	76,106	88,222	75,125	29,515
Netherlands	..	..	..	..	..	..	..	815	1,742	4,513	11,986	12,171
Italy	1,001	87	390	48	688	659	811	650	1,680	7,347	20,222	15,278
Australasia	..	..	..	..	..	..	..	..	..	..	..	8,413
Other Countries	..	..	194	132	45	..	123	182	2,554	2,822	20,523	39,515
Total	1,936	314	1,397	620	1,444	4,576	17,127	72,515	184,910	295,541	413,411	422,218

Countries whence Consigned.	20 Degrees.	21 Degrees.	22 Degrees.	23 Degrees.	24 Degrees.	25 Degrees.	20 Degrees.	27 Degrees.	28 Degrees.	29 Degrees.	30 Degrees.	Total not exceeding 30 Degrees.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Spain	64,678	62,817	111,444	150,396	75,727	79,299	84,683	315,309	739,192	663,232	243,715	2,631,864
Portugal	2,651	3,175	3,060	2,790	2,022	3,464	8,976	88,102	224,985	374,807	140,787	855,731
Madeira	..	..	..	..	..	..	..	..	2,816	5,037	5,127	12,980
France	240,902	128,746	110,566	109,432	113,936	47,558	26,181	10,952	17,709	16,789	6,149	1,726,039
Germany	10,437	3,551	3,298	1,039	555	972	2,523	8,801	42,957	135,485	28,515	560,148
Netherlands	6,632	634	497	648	1,811	112	5,066	1,775	1,674	2,327	1,247	53,650
Italy	23,474	10,991	12,395	5,239	7,423	19,096	55,795	29,563	12,824	41,261	10,900	277,822
Australasia	6,424	3,878	15,995	100,769	138,649	128,476	167,489	42,442	8,232	336	194	621,297
Other Countries	57,502	29,605	16,311	6,338	4,600	5,002	13,320	28,042	67,414	183,880	65,915	544,019
Total	412,700	243,397	273,566	376,651	344,723	283,979	364,033	524,986	1,117,803	1,423,154	502,549	7,283,550

Statement showing the *Quantity of Wine Imported* in Cask, &c.—*continued.*

Countries whence Consigned.	31 Degrees.	32 Degrees.	33 Degrees.	34 Degrees.	35 Degrees.	36 Degrees.	37 Degrees.	38 Degrees.	39 Degrees.	40 Degrees.	41 Degrees.	42 Degrees.	Exceeding 42 Degrees.	Total exceeding 30 Degrees.	Untested.	Grand Total.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons	Gallons.	Gallons.
Spain ..	18,562	49,149	93,804	130,371	69,215	45,518	26,628	28,515	17,340	13,260	631	25	114	493,132	1,803	3,120,799
Portugal ..	12,051	57,134	194,546	470,325	719,869	680,086	362,290	193,621	37,484	13,274	2,386	396	117	2,743,579	250	3,599,560
Madeira ..	5,518	6,600	8,431	7,417	4,428	313	66	65	169	27	22	..	..	33,056	455	46,491
France ..	397	399	2,489	4,959	..	..	1,264	..	..	..	..	..	..	9,508	1,274	1,736,821
Germany ..	242	2,759	188	5,377	736	2,063	2,076	870	259	2,309	774	881	..	19,134	..	579,282
Netherlands ..	108	..	..	..	..	..	..	..	..	..	..	..	..	108	..	53,758
Italy ..	2,283	8,165	6,012	1,539	1,356	2,201	2,510	1,880	..	..	..	..	..	25,946	..	303,768
Australasia ..	..	..	178	33	35	13	70	..	..	..	..	..	34	363	..	621,660
Other Countries	4,418	19,714	377	1,151	721	2,248	1,160	1,137	14	..	..	57	..	30,977	23	575,019
Total ..	43,579	143,920	306,025	621,152	796,360	733,042	396,064	226,088	55,266	28,870	3,813	1,359	265	3,355,803	3,805	10,643,158

		Gallons
Quantity of Wine imported in Casks	.. ..	10,643,158
" " " Bottles	.. ..	1,689,754
Total quantity of Wine imported	.. .. ..	12,332,912

Note.—No materials are available for showing the exact quantity of Wine imported at each degree of alcoholic strength. The strength of Wines entered to be tested is ascertained *in the great majority of cases* by testing samples drawn from representative casks, and the result is applied to all the casks represented. Practically all Wines imported in bottles are admitted without test.

Statistical Office, H.M. Customs and Excise, London,
15th April, 1914.

H. V. READE,
Principal of Statistical Office.

To those familiar with wine trade matters, the above figures will be readily intelligible, but for the benefit of the general reader, a few comments will not be out of place.

The Australian Export Type.

In wine circles it is now generally known that Australia has evolved a type of wine distinctly its own, and that no wine similar to it is produced, in quantity, in any of the old vine-growing countries. This fact is very clearly evidenced by the return under review, which shows that the great bulk of Australian shipments are at strengths of from 23 per cent. to 26 per cent. of proof spirit; 535,383 gallons, out of a total of 621,660, or 86 per cent. of our total shipments to Great Britain, are between these limits. *It is also worthy of note that 99 per cent. of our shipments are below 31 per cent.*; the quantity exceeding 28 per cent. is, in fact, insignificant. *It is thus evident that we do not ship fortified wines to the Mother Country.*

The evolution of this distinctive Australian type is the outcome of the cultivation of vine varieties from such choice French wine districts as the Medoc and Hermitage, under the warmer Australian sun. It appears to have filled a want in the cold English climate, and it is to the credit of the firms who have built up the Australian wine export trade that the want was discovered and steps taken to meet it.

European Shipments.

Several interesting facts concerning these are also shown. France, for example, mainly ships wines of from 17 per cent. to 20 per cent., with lesser, but still important, quantities up to 24 per cent., beyond which strength very little is shipped. The return, dealing as it does, with wine in cask, champagne is not included. This, no doubt, constitutes a large proportion of the total bottle imports (1,689.754 gallons).

Spanish shipments are largest at from 27 per cent. to 30 per cent. The so-called Tarragona ports and lighter sherries would be here included, whilst the 293,390 gallons at from 33 per cent. to 35 per cent.—in fact, the bulk of the 493,132 gallons over 30 per cent.—would be mainly sherry. *Spain also ships somewhat largely at* 22 per cent. and 23 per cent.

Portugal mainly ships ports at from 33 per cent. to 38 per cent. (2,743,579 gallons over 30 per cent.), though she also ships fairly large quantities of light ports at from 28 per cent. to 30 per cent.

Germany's chief shipment are hocks and moselles at 15 per cent. to 19 per cent. The considerable shipments at 28 per cent. to 30 per cent. are curious.

Italy ships half as much as Australia, the bulk being below 30 per cent. Her shipments are characterized by moderate lots over a wide range of different strengths.

AMERICAN FERTILISER ADVERTISING.

The proprietors of a New England fertiliser manufactory are offering a prize of 500 dollars to the man, woman, boy or girl who in 1914 can grow a certain crop on a measured acre of land.

The intention, it is stated, is that people should learn to farm industriously, and farm with brains.

Presumably, the suggestion is that the employment of brains will carry with it as an accompaniment the employment of the particular brand of fertiliser which this manufactory produces. But that is incidental. The competitor may try others if he prefers. The advertiser, one perceives, has much faith in his product.

Extract from "Fertilisers."

14th March, 1914.

This scheme has much to commend in it, and certain it is that there are many farmers' sons in Victoria who would receive every assistance from their father when casting the glimmering eye upon the 500-dollar prize if such a scheme was installed in this State.

About 1840 Liebig found that bone phosphate was improved by treating with sulphuric acid, and soon afterwards Lawes applied the treatment to rock phosphate. In 1842 he took out a patent, and started the superphosphate industry.

Almost the whole of the World's potash comes from Germany. The Stassfurt deposits have been worked since 1862.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

MONTHLY REPORT ENDING 14th JULY.

The third monthly report of the above competition is as follows:—

The weather during the past month has been very severe for egg production, as low temperatures have been noted. The days and nights have been very cold, the temperature on many occasions being 44 deg. to 54 deg. all day.

The evening grain consisted of wheat, oats, and maize, and in cold weather the quantity of maize was increased.

The general health of the birds is good, taking into consideration the weather.

Light Breeds, Wet Mash.—The leading pen (J. H. Gill, pen 25) has now a total of 421 eggs, whilst (E. A. Lawson, pen 36) is second with a total of 399 eggs; the third (J. J. West, pen 9) has 375 eggs to its credit.

Light Breeds, Dry Mash.—W. N. O'Mullane (pen 60) is leading with a total of 373 eggs; E. A. Lawson (pen 55) is second with a total of 358 eggs; and the third, C. Lawson (pen 53), has 327 eggs to its credit.

Heavy Breeds, Wet Mash.—The leading pen (J. McAllan, pen 77) has a total of 370 eggs, with (J. Ogden, pen 71) second with a total of 361 eggs. The third (D. Fisher, pen 81) has 348 eggs to its credit.

Heavy Breeds, Dry Mash.—T. W. Coto (pen 94) is leading with a total of 319 eggs; D. Fisher (pen 100) is second with a total of 305 eggs; and third, A. Greenhalgh (pen 98) has 289 eggs to its credit.

The rainfall, spread over thirteen days, registered 253 points.

FOURTH EGG-LAYING COMPETITION, 1914-1915.

Commencing 15th April, 1914.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen.	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th June.	15th June to 14th July.	Total to date, 3 months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns	*J. H. Gill*	280	141	421	1
36	..	E. A. Lawson	265	134	399	2
9	..	J. J. West	265	110	375	3
10	..	R. Hay	249	123	372	4
26	..	Mrs. H. Stevenson	257	102	359	5
37	..	S. Brown	223	122	345	6
45	..	H. C. Brock	238	104	342	7
17	..	S. Doldisen	229	110	339	8
16	..	A. R. Simon	215	123	338	9
3	..	T. A. Pettigrove	230	106	336	10
40	..	J. Schwabb	202	123	325	11
19	..	Marville Poultry Farm	215	102	317	12
44	..	A. Ross	207	110	317	
20	..	*V. Little*	186	125	311	14
4	..	Giddy and Son	195	113	308	15
12	..	A. H. Mould	185	119	304	16
35	..	*W. Tatterson*	192	110	302	17
33	..	W. G. Osborne	184	116	300	18
23	..	S. Buscumb	179	106	285	19
11	..	C. J. Jackson	189	81	270	20
34	..	W. A. Rennie	168	98	266	21
28	..	Utility Poultry Farm	179	85	264	22
13	..	H. Hanbury	140	114	254	23
47	..	W. G. Swift	140	110	250	24
1	..	F. G. O'Bree	163	86	249	25
30	..	G. W. Robbins	136	111	247	26
15	..	*E. Waldon*	123	124	247	
24	..	C. Pyke	159	75	234	28
2	..	J. C. Armstrong	137	97	234	
38	..	*G. Hayman*	127	105	232	30
8	..	F. W. Brine	127	100	227	31
48	..	Bennett and Chapman	124	102	226	32
22	..	B. Mitchell	165	57	222	33
6	..	C. R. Jones	133	80	213	34
31	..	E. H. Bridge	146	64	210	35
32	..	Gleadell Bros.	109	92	201	36
20	..	A. W. Hall	104	86	190	37
21	..	R. A. Lewis	95	90	185	38
42	..	E. W. Hippe	126	58	184	39
18	..	All-lay Poultry Farm	129	44	173	40
14	..	F. C. Western	51	112	163	41
49	..	A. Beer	120	42	162	42
43	..	*G. Mayberry*	78	65	143	43
27	..	Walter M. Bayles	45	89	134	44
41	..	Doncaster Poultry Farm	72	59	131	45
39	..	*R. L. Appleford*	75	50	125	46
5	..	A. Mowatt	46	61	107	47
50	..	F. G. Silbereisen	52	43	95	48
7	..	B. Cohen	57	32	89	49
46	..	C. L. Sharman	70	12	82	50
		Total	7,781	4,623	12,404	

FOURTH EGG-LAYING COMPETITION, 1914-1915—*continued*.

Pen.	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th June.	15th June to 14th July.	Total to date, 3 months.	Position in Competition.
		LIGHT BREEDS—*continued*.				
		DRY MASH.				
60	White Leghorns ..	W. N. O'Mullane ..	230	143	373	1
55	" ..	E. A. Lawson	240	118	358	2
53	" ..	C. Lawson	228	99	327	3
65	" ..	W. G. Osborne	184	135	319	4
58	" ..	Miss L. Stewart	219	92	311	5
51	" ..	Moritz Bros.	195	84	279	6
68	" ..	E. W. Hippe	185	89	274	7
61	" ..	H. Hanbury	110	117	227	8
62	" ..	A. Greenhalgh	161	60	221	9
57	" ..	J. Jackson	135	81	216	10
63	" ..	Hanslow Bros.	116	98	214	11
69	" ..	C. J. Beatty	140	71	211	12
64	" ..	E. A. Carne	122	36	158	13
67	" ..	Walter M. Bayles ..	66	88	154	14
70	" ..	W. H. Robbins ..	69	81	150	15
54	" ..	G. Carter	54	87	141	16
52	" ..	Myola Poultry Farm ..	61	77	138	17
59	" ..	F. G. Silbereisen ..	102	5	107	18
66	" ..	S. Brown	28	50	78	19
56	" ..	R. C. Buchan	19	48	67	20
		Total	2,664	1,659	4,323	
		HEAVY BREEDS.				
		WET MASH.				
77	Black Orpingtons ..	J. McAllan	240	130	370	1
71	" ..	J. Ogden	214	147	361	2
81	" ..	D. Fisher	227	121	348	3
84	Rhode Island Reds	J. Mulgrove	203	120	323	4
82	Black Orpingtons ..	J. H. Wright	211	111	322	5
88	" ..	H. H. Pump	206	106	312	6
72	" ..	T. W. Coto	160	105	265	7
89	" ..	Marville Poultry Farm ..	143	141	284	8
76	" ..	W. P. Eckerman ..	141	126	267	9
74	" ..	S. Brown	147	99	246	10
75	" ..	Fairdeal Poultry Farm ..	158	80	238	11
83	" ..	Cowan Bros.	142	84	226	12
78	Red Sussex ..	Jorgen Anderson ..	169	56	225	13
87	Black Orpington ..	A. Douglas	117	63	180	14
73	" ..	J. A. McKinnon ..	118	59	177	15
85	Golden Wyandottes	J. C. Mickelburg ..	78	83	161	16
86	Buff Wyandottes ..	W. G. Swift	86	55	141	17
79	Barred Plyth. Rocks	Bennett and Chapman ..	16	78	94	18
80	White Plyth. Rocks	Stranks Bros.	19	24	43	19
		Total	2,795	1,788	4,583	
		DRY MASH.				
94	Black Orpingtons ..	T. W. Coto	204	115	319	1
100	" ..	D. Fisher	214	91	305	2
98	" ..	A. Greenhalgh	205	84	289	3
97	" ..	J. McAllan	139	79	218	4
90	" ..	J. H. Wright	70	99	169	5
91	" ..	C. E. Graham	100	59	159	6
96	Rhode Island Reds	Myola Poultry Farm ..	29	92	121	7
92	" ..	Fairdeal Poultry Farm ..	80	40	120	8
93	" ..	Myola Poultry Farm ..	16	95	111	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	9	51	60	10
95	" ..	C. L. Hewitt	18	26	44	11
		Total	1,084	831	1,915	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne.

STATISTICS.

DEPARTMENT OF AGRICULTURE, VICTORIA.

PRODUCE INSPECTED AND EXPORTED FROM VICTORIA FOR MONTH OF JUNE, 1913 and 1914.

(Not including Wool, Hides, and Other Products, the Inspection of which is not under Government Supervision.)

Description of Produce		Quantities.		Values.	
		1913.	1914.	1913.	1914.
Dairy Produce—				£	£
Butter	lbs.	371,728	321,680	18,256	15,798
Milk (dried)	cases	1,100	42	1,320	105
Milk and Cream	„	*10,855*	*358*	*27,137*	*428*
Cheese	lbs.	9,720	1,186	243	30
Ham and Bacon	„	1,680	6,294	84	315
				47,040	16,676
Poultry	head	3,000	60	300	29
Meat—					
Mutton	crcs.	41,187	60	20,593	35
Lamb	„	29,719	..	14,860	..
Beef	qrs.	2,722	1,665	6,805	4,162
Veal	crcs.	351	187	472	280
Meat Sundries	lbs.	..	2,100	..	9
				42,730	4,486
Rabbits and Hares	pairs	401,850	146,724	16,743	6,113
Tallow	cwt.	16,313	11,967	23,542	16,610
Flour and Grain—					
Wheat	centals	240,220	687,311	77,772	224,826
Oats	„	496	6,168	189	1,520
Flour	„	140,589	160,631	59,114	63,892
Maize	„	..	..	..	..
				137,075	290,238
Fodder—					
Chaff and Hay	cwt.	6,848	4,364	1,277	1,206
Chaff (compressed)	„	8,204	24,175	1,698	3,645
				2,975	4,851
Potatoes—					
Oversea	*bags*	*376*	*551*	*113*	*167*
„	cases	..	95	..	33
Inter-State	bags	92,668	30,058	27,992	9,010
„	cases	80	135	26	45
				28,131	9,255
Onions—					
Oversea	bags	*4,019*	*529*	2,008	264
„	cases	..	80	..	32
Inter-State	bags	11,305	9,424	5,655	4,370
„	cases	..	13	..	6
				7,663	4,672

PRODUCE INSPECTED AND EXPORTED FROM VICTORIA FOR MONTH OF JUNE, 1913 AND 1914—*continued.*

Description of Produce.		Quantities. 1913.	Quantities. 1914.	Values. 1913.	Values. 1914.
				£	£
Fruit—					
Fresh	cases	7,481	4,201	3,740	2,100
Dried	,,	14,706	4,747	29,412	9,494
Canned	,,	169	94	338	188
Pulp	lbs.	..	240	..	6
				33,490	11,788
Sundries—					
Honey	lbs.	1,855	3,359	55	124
Jams	,,	148,196	23,574	2,329	472
Agricultural Seed	pkgs.	62	158	186	474
Plants and Shrubs	,,	189	213	189	213
				2,759	1,283
Totals	..	..	..	342,448	366,001

PRODUCE INSPECTED AND EXPORTED FROM VICTORIA FOR TWELVE MONTHS, 1912 and 1913, and 1913 and 1914.

(Not including Wool, Hides, and Other Products, the Inspection of which is not under Government Supervision.)

Description of Produce.		Quantities. 1912 and 1913.	Quantities. 1913 and 1914	Values. 1912 and 1913.	Values. 1913 and 1914.
				£	£
Dairy Produce—					
Butter	lbs.	30,674,327	31,921,007	1,477,531	1,562,325
Milk (dried) ..	cases	9,814	16,124	11,771	19,763
Milk and Cream	,,	29,739	7,759	74,347	18,925
Cheese	lbs.	107,242	771,312	2,691	19,227
Ham and Bacon	,,	41,760	74,079	1,813	3,142
				1,568,153	1,623,382
Poultry	head	28,592	28,732	5,365	5,954
Meat—					
Mutton	crcs.	537,327	999,176	268,662	499,592
Lamb	,,	717,152	1,262,936	358,476	631,469
Beef	qrs.	28,624	146,572	71,250	366,419
Veal	crcs.	3,486	11,971	5,175	18,597
Pork	,,	..	42	..	105
Meat Sundries	lbs.	..	903,787	..	3,717
				703,563	1,519,899

PRODUCE INSPECTED AND EXPORTED FROM VICTORIA FOR TWELVE MONTHS, 1912 AND 1913, AND 1913 AND 1914—*continued.*

Description of Produce		Quantities.		Values.	
		1912 and 1913.	1913 and 1914.	1912 and 1913.	1913 and 1914.
				£	£
Rabbits and Hares ..	pairs	1,632,342	1,541,038	68,993	64,710
Tallow	cwt.	161,509	297,819	223,154	405,476
Grain and Flour—					
Wheat	cntls.	6,395,794	12,795,072	2,039,701	3,941,281
Oats	,,	31,104	61,190	10,377	17,437
Flour	,,	1,649,052	1,838,117	719,528	757,069
Maize	,,	446	141	224	90
				2,769,830	4,715,877
Fodder—					
Chaff and Hay ..	cwt.	103,282	95,308	24,942	18,612
Chaff (compressed) ..	,,	103,018	108,688	23,080	20,379
				48,022	38,991
Potatoes—					
Oversea	bags	3,101	3,125	1,269	778
,, ...	cases	1,510	820	623	245
Inter-State	bags	546,846	600,409	250,425	139,984
,, ...	cases	186	7,067	120	2,299
				252,437	143,306
Onions—					
Oversea	bags	20,931	1,012	9,660	8,914
,, ...	cases	34,861	52,310	14,906	22,399
Inter-State ..	bags	87,375	109,299	50,111	53,246
,, ...	cases	2,516	7,572	972	993
				75,649	85,552
Fruit—					
Fresh	cases	398,444	393,916	199,223	196,956
Dried	,,	36,005	30,411	72,110	59,902
Canned	,,	11,732	7,052	17,464	14,104
Pulp	lbs.	25,758	78,640	428	996
				289,225	271,958
Sundries—					
Honey	lbs.	17,273	31,953	789	1,105
Jams	,,	2,238,761	1,187,001	24,013	17,514
Agricultural Seeds ..	pkgs.	720	2,400	2,212	3,418
Plants and Shrubs ..	,,	907	893	907	900
				27,921	22,937
Totals ..	..	..	..	6,032,312	8,898,042

STATEMENT SHOWING QUANTITY AND VALUE OF IMPORTS DEALT WITH BY PRODUCE DIVISION FOR JUNE, 1913 and 1914.

Description of Produce.	Quantities.		Values.	
	1913.	1914.	1913.	1914.
			£	£
Almonds	..	87	..	261
Apples	47	389	24	194
Barley	23,570	13,153	21,213	11,838
Bananas .. bunches	20,095	42,977	5,024	10,734
„ .. cases	11,456	17,709	5,728	8,854
Beans (dry)	279	1,147	837	3,441
Cocoanuts	490	..	539	..
Coffee and Cocoa Beans	1,180	479	3,540	1,437
Copra	41	955	102	2,387
Cucumbers	..	342	..	86
Figs	12	5	18	8
Fruit (dried)	1,336	302	2,004	453
„ (mixed)	..	11	..	6
Green Ginger	30	12	45	18
Hops	82	73	328	292
Hay	12	25	3	6
Linseed	164	..	492	..
Logs	2,000	3,105	2,000	3,105
Maize	2,585	55	1,292	27
Nuts	615	1,271	3,075	6,355
Oranges and Lemons	30,051	35,147	15,025	17,573
Oats and Wheat	655	1,179	392	708
Oat Hulls	413	3,486	41	348
Peas and Lentils	3,135	1,468	9,405	4,404
Potatoes	7	73	3	36
Passion Fruit	79	788	59	591
Plants and Bulbs	261	340	522	680
Pineapples	2,586	5,173	1,035	2,067
Pears	..	4	..	2
Rice	43,163	4,014	47,479	4,415
Seed	3,201	4,102	9,603	12,306
Spice	648	226	1,944	678
Tomatoes	..	51	..	18
Vegetables	138	3,250	69	1,625
Yams	106	..	53	..
Total	..	..	131,894	94,951

TOTAL VALUES.

	1912.		1913.
	£		£
July	109,890	..	102,503
August	112,941	..	81,960
September	91,978	..	66,392
October	80,584	..	68,374
November	98,524	..	82,410
December	82,625	..	47,883
	1913.		1914.
January	104,534	..	73,562
February	94,562	..	60,476
March	94,321	..	141,895
April	162,426	..	117,614
May	115,519	..	183,816
June	131,894	..	94,951
	1,279,798	..	1,121,845

R. CROWE, Export Superintendent.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray stone fruits with the red oil emulsion at this time, as there will be danger of burning and destroying any early buds that may be swelling, and consequently loosening their outside scales. It will be safe, if the work be done at once, to spray apple, pear, and quince trees with this spray, especially where the Bryobia mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime and sulphur wash will be the specific for these and other pests, it may still be used with safety, although the spraying should be completed as early as possible. This mixture has a certain value as a fungicide, and it is well worth trying on peach trees that have previously been affected with leaf curl; more especially in view of the fact that in some districts severe burning has occurred in peach orchards as a result of using Bordeaux mixture late in the season.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, adding a teaspoonful of caustic soda to a cask of steeping stems. The liquid may be used strong, and every endeavour should be made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month. Pruning of evergreens, such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees should be planted not later than this month, according to the directions given in last month's notes. The soil should be trodden firm round the roots, and, when planting has been completed, the trees should be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. The soil should be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept, and the insects should be regularly collected and destroyed.

Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds, stable manure should be well worked into the soil.

The soil should be rich, well worked and warm, so that a quick growth may result. Vegetables grown quickly are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will therefore be necessary, and, in the rows, hand weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then place a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds, they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots, placing three or four seeds in each pot. They then suffer no check when being transplanted into beds.

Flower Garden.

All winter flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings that are growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox may still be planted out. If it is intended that such plants shall remain in the same location as last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By these means, the plants retain their vigour, and are able to produce good flowers each season.

Evergreen shrubs may now be planted out, the soil having previously been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Still continue to feed stabled horses well; feed green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Continue giving hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Feed stallions doing stud duty liberally.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up

treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or oats in a box or trough. Give a cupful of limewater per calf per day in the milk.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties.

Sheep.—Shearing early, where prudent, will allow ewes and lambs to recover in condition before summer, as well as avoiding grass seed and dust. Lambs unlikely to be good enough for freezing thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Clear carefully all straw, chaff, &c., from shearing shed and wool bins. Take the opportunity during shearing to cut back all misshapen feet.

Poultry.—September is one of the best months for hatching winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined (dry) bone, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with Bordeaux mixture as the blossom buds are opening, as a preventive against "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

Vineyard.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab with acid iron sulphate vines which showed signs of Black Spot last season. To avoid burning, this must be completed before the buds commence to swell. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar. Conclude spring racking early in month, if not already done. Fill up completely all unfortified wines.

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SCIENCE AND AGRICULTURE.

Visit of the Agricultural Section of the British Association for the Advancement of Science to the Central Research Farm, Werribee, 15th August, 1914.

One of the excursions arranged for during the session of the British Association in Melbourne was to the Central Research Farm at Werribee. Dr. S. S. Cameron, Director of Agriculture, was the leader of the excursion, and the 250 visitors and guests who travelled by special train from Melbourne were joined at Werribee by about fifty local farmers

The Minister of Agriculture (Hon. W. Hutchinson) welcoming Members of the British Association.

and residents, who kindly provided vehicles for the conveyance of the visitors to the farm gates, about one mile from the railway station.

The visitors were received at the entrance to the farm by the Hon. the Minister of Agriculture (Mr. W. Hutchinson, M.L.A.), who, in welcoming them, said that the Government and the people of Victoria

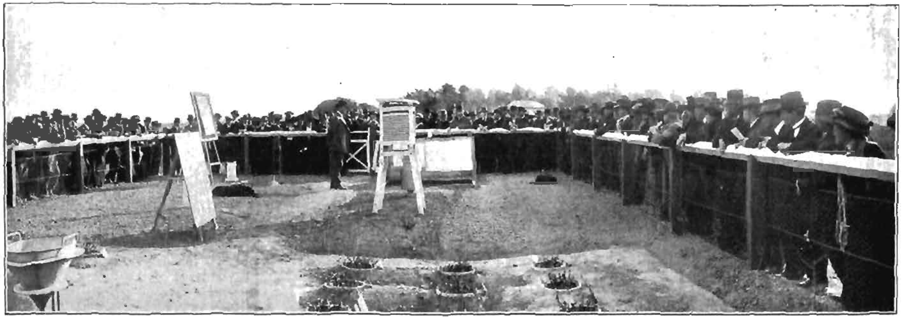
were delighted that the British Association had chosen to have their meeting and their visit to Australia this year. Speaking as Minister of Agriculture, and more particularly for the agricultural community, he would like to express his and their great pleasure that the agricul-

A group of Agricultural Science Workers.

Reading from left to right—Prof. Cherry, Melbourne University; Mr. J. Golding, F.I.C., College of Agriculture, Reading; Mr. P. G. Bailey, M.A. (Cantab.), Cambridge University Research Scholar; Dr. Lyman Briggs, Bureau of Plant Industry, Washington, U.S.A.; Mr. Catton Grosby, Perth (W.A.); Dr. Alex. Lauder, Professor of Agriculture, Edinburgh; Mrs. John Golding; Hon. W. Hutchinson, Minister of Agriculture, Victoria; Dr. A. D. Hall, Chief Commissioner Agricultural Developmental Board, England, formerly Director Rothamstead Experiment Station; Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Victoria; Mr. Beaven, Cambridge; ————, ————; Dr. S. S. Cameron, Director of Agriculture, Victoria; Mr. H. Pye, Principal Dookie Agricultural College, Victoria.

The Visitors on a Round of Inspection.

tural section of the Association had honoured them with a visit, and, on behalf of the Government and the people, he desired to bid them a most hearty welcome to the Central Research Farm.



Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Expounding Methods of Scientific Research on Problems in Agriculture.

(Within the railed enclosure are kept the records of soil and air temperature, humidity evaporation and rainfall, and hours of bright sunshine. In the foreground are a series of pot experiments (92 pots) designed to test the water requirements of various farm crops at each and every stage of growth, and the availability of certain natural and artificial phosphates under varying systems of soil treatment.)

They were pleased to show the oversea visitors the experimental work they were undertaking in connexion with the problems which faced the Victorian farmer. It must be remembered that this was only a "baby" experiment station, being only two years old, and, therefore, could not make as big a showing as more matured experiment propositions could do. However, what they had done they were glad to show the visitors, and the visit that afternoon would indicate the lines along which the Government and the Agricultural Department were moving in.

He admitted that there was a somewhat selfish element behind the welcome, because the visitors from overseas included some of the most distinguished and experienced agricultural scientists of the Old World. Whilst he bid them welcome for their own and our sakes, they were anxious "to sit at their feet" as learners, and to ascertain from healthy criticism any methods they might suggest for the improvement of the work being carried on at present.

The Minister announced certain lectures which would be delivered during the ensuing week at the University, and, while they were primarily intended for members of the Association, so far as room would permit, the members of the Agricultural Section had asked him to state that all those interested in rural industries and agricultural pursuits would be very welcome.

Mr. Richardson, the Agricultural Superintendent, would take charge of the oversea visitors, and would be assisted by Dr. Cameron (Director of Agriculture), Mr. H. C. Wilson (manager of the farm), and, he thought, Professor Cherry would gladly lend his aid, so that parties could be guided around the farm and informed of the work going on.

In conclusion, he again bid them a hearty welcome, and hoped the afternoon would be a very interesting and instructional one from all points of view.

Mr. Richardson stated that before making a detailed inspection, he would like to make a few preliminary observations of a general character. In the first place, the farm comprised three distinct sets of activities, viz., dry-farming investigations, irrigation investigations, stock breeding and stock feeding. The average rainfall for the last forty-two years at the township of Werribee was 20¼ inches, but since the farm had been established, the rainfall had been much less than this amount. Last year they had only 16½ inches, and for the first seven and a half months of the present year only 6.4 inches—one-third of the yearly total. He thought it necessary to mention those facts, as some of the visitors might think the crops were languishing, and doubtless they would have been more forward with a normal rainfall. If they had 20 inches of rain every year the work projected would be a very satisfactory proposition. The rainfall at Werribee was not as effective as in other parts of the State, as strong winds swept the wide plains at many times of the year, and the evaporation was considerable. Last year no less than 45 inches of water was evaporated from the free surface of lakes and dams in the district. Another factor was that the rain came only in light showers, owing probably to the proximity to the coast-line; this made dry-farming problems more difficult, but more interesting. The dry-farming investigations in progress comprise crop rotation, seed selection, soil fertilization, soil renovation tests, wheat breeding investigations,

and general research. The irrigation experiments comprise seeding and inoculation tests, top dressing, and fertilizing experiments with various irrigated forages.

Mr. Richardson outlined the route of inspection to be followed, and delivered a short explanatory address at each section.

At the conclusion of the inspection, and after refreshments had been partaken of by the visitors, Dr. Cameron, in introducing Dr. A. D. Hall, President of the Agricultural Section of the British Association, said that doubtless his name was familiar to all present as late Director of the famous experiment station at Rothamstead, in England, and he had expressed a desire to convey the thanks of the Agricultural Section on this occasion.

Dr. Hall said he did not think that the oversea members of the British Association should leave without expressing, in the first place, their very sincere sense of appreciation of the hospitality received and the many kindnesses from all hands since their arrival in Australia.

In the second place, they should express the admiration of every member of their party who was at all familiar with agriculture, of the experiment station at Werribee. As Dr. Cameron had said, he had been connected with one of the oldest experiment stations in the world—one that at the present time was in the seventy-first year of its history—and when he heard that this beautifully-laid-out farm, with its experimental plots, which he could see were so carefully conceived and attended to, and so calculated to give exact returns, was not more than two years old, well, he could see how rapidly things grew in Australia. (Hear, hear!) The experiment station he had been connected with at Rothamstead was over seventy years old, and many of the results which that station was finding out were only coming to light at the present time. It was not sufficient for the farmers of the great State of Victoria to be satisfied that an experiment station had been started on their behalf. They must keep it going, and, above all things, they must have patience. The work of experiment investigation and research in agriculture was not to be accomplished in one year, nor even in ten years. He could speak from his own experience and from the experience of others working in the same line, that the result of the most ordinary experiment could not be obtained under about five years' work. It must be remembered that the problems in Australia were enormous, and to the solution of which they had very little guidance. There was the greater necessity, therefore, for experiments being conducted towards the development of a system of farming that was calculated to meet local conditions and soil.

The message he had to give was: "Back up your experiment station, have patience with the men working on your behalf, supporting them, believing in them, and having confidence that in the end their work would give information of incalculable value."

Dr. Cameron called for three hearty Australian cheers for the oversea visitors, which were vigorously given. The National Anthem was then sung by all present.

WORK OF THE AGRICULTURAL SECTION.

The following are abstracts of papers read at the Melbourne session of the British Association for the Advancement of Science in the Agricultural Section. No abstracts are available of the papers of Dr.

Lyman J. Briggs, Dry-farming Investigations in the United States; and Mr. J. H. Dethridge, Irrigation in Victoria:—

TRIALS OF MILKING MACHINES.

By Dr. R. Stenhouse Williams, J. Golding, and James Mackintosh, College of Agriculture, Reading, England.

At the trials of milking machines arranged by the Royal Agricultural Society of England in 1913, the chemical and bacteriological tests were conducted by the authors. Eleven machines competed, and the paper discusses the various lines of development along which future progress may take place.

At the outset it may be stated that the Committee excluded syphon machines on the grounds "that they were rightly considered by the Society to be injurious to the cows."

There remained then two types of machine:—

A. Pressure machines, those in which an attempt was made to simulate the process of hand-milking, and

B. Suction machines, those in which suction in one form or another was employed.

Of the former three competed. The bacteriological results were as follow:—

O	P	Q
675	4,603	5,161

which represents the average bacteriological content per c.c. during the trials.

REMARKS ON PRESSURE MACHINES.

O. *Squeezing the teats from above downwards. No friction on udder.* Milk caught in open pail.

P. Squeezing of teats by rubber plates associated with adjustable shields which massaged the udder during milking, thus dislodging hairs and dirt particles. Open bucket underneath the udder.

Q. The milk was expressed by pressure only and conveyed by short channels to an open tray, thence by a tube to the receiver which is suspended underneath the cow. As it enters the receiver the milk is strained.

REMARKS ON SUCTION MACHINES.

The results obtained with these machines depend, firstly, on the defects in the machines themselves, and, secondly, on the care and skill of the operator. It was not always possible to differentiate between these, but the following instance may be given as indicating the effect of want of care in this direction.

A (average bacteriological count 3,103 per c.c.) compared with D (average bacteriological count 1,579 per c.c.).

A was a better machine, but not so well cleaned.

Again, if we consider four of the suction machines, in all of which reasonable care was taken in the cleaning, we find that the average count varied from about 2,000 to about 4,000 organisms per c.c. On the other hand, the two machines, in which the cleansing was undoubtedly indifferent, had average counts of 41,419 and 12,384. The bacterial content in the machine giving 12,384 was mainly due to inefficient cleansing of the machine. In the machine giving 41,419, insufficient cleansing, excessive length of rubber tubing, and leakages contributed to the high count.

It appears, therefore, that suction machines, as exhibited in this trial, depended to an unreasonable extent on the personal equation, and demanded an amount of intelligence that cannot be expected from the average cow-man.

The results seem to indicate that some type of pressure machine milking directly into a covered can might give the most effective bacteriological results in the hands of an ordinary worker.

The suction machines with their tubing and fittings require a cleaning between each milking, which almost amounts to bacteriological sterilization, if really good results are to be obtained. The absence of the means to effect this on many farms, and the lack of training in those who have to perform the work, render a plea for the simplification of the machine specially cogent.

METHODS OF MILK RECORDING.

By Alexander Lauder, D.Sc., Professor of Agriculture, East of Scotland Agricultural College.

In this paper a short account is given of the methods of obtaining the milk records of dairy cattle as carried out in Scotland and Ireland. In Scotland the

work has been practically confined to the Ayrshire breed. A scheme has been in operation since 1903, but in the earlier years the number of herds under inspection was comparatively small. The work is now under the direction of the Scottish Milk Records Committee, a representative body in receipt of an annual grant from the Development Fund. In 1914 this grant amounted to £2,000. The number of cows under inspection has increased rapidly from year to year, and during the present year has reached 25,000.

The work is carried on through local societies consisting of twelve to twenty-four members, so that the work of each society is sufficient to take up the whole time of a recorder. The weighing and testing may be done every fourteen, twenty-one, or twenty-eight days, according to circumstances, an interval of twenty-one days being the most common in Scotland. The recorder arrives at the farm in the afternoon, weighs, and determines the percentage of fat in the evening milk and the morning milk next day. All the testing and weighing is done by the recorder, the farmer being only asked to supply details as to feeding, times of calving, &c. A copy of the record is left with the farmer, and a copy forwarded to the offices of the Central Committee.

Finance.—The expense of carrying on a local society may be put at about £80 per annum. Part of this expenditure is met by a grant from the Central Committee, and the remainder is apportioned between the members. In some societies the members are charged so much per cow. The cost per cow is from 1s. 9d. to 1s. 10d. per annum, and each member is charged on a minimum of forty cows.

Results.—The systematic keeping of records of the yield of milk and the percentage of fat has led to the gradual elimination of the less productive cows from the herds. In this way the average yield of the herds has been greatly increased, and also their value, especially for export purposes. In some herds the average annual yield per cow has been increased by 100 to 200 gallons in six to eight years.

The increase in the value, since the beginning of the scheme, of pedigree (milk record) Ayrshires for export purposes is estimated at about 50 per cent.

In this connexion the importance of the sire being descended from a dam of good milking qualities has been proved by experiment, and cannot be too strongly emphasized.

Classification of Cows.—For purposes of comparison the yield of milk is calculated to the equivalent amount containing 1 per cent. fat.

In judging cows at cattle shows, the more rational method of taking into account the milk-yielding capacity of the cow is gradually superseding the former method of depending solely on appearance. Three classes are now commonly adopted:—i. For cows giving over 1,200 gallons; ii., for those over 1,000 gallons; iii., for those over 800 gallons.

Irish Method.—The milk recording and testing in Ireland are carried out under a scheme of the Department of Agriculture and Technical Instruction. Under this scheme the cows have first to be inspected and approved. The farmer weighs the milk on one definite day per week, and his herd and records are open to inspection at any time without notice. The Department's inspector checks the farmer's weighings, and takes samples of the milk at intervals for analysis. Approved cows, of proved milk-yielding capacity, are then eligible for entry in the Department's Herd Book.

A short account is given of Gavin's statistical inquiry into the accuracy of estimating a cow's milking capacity by her first lactation yield [Gavin, "The Interpretation of Milk Records" (*Journal Royal Agricultural Society*, 1912, p. 153); "Studies in Milk Records" (*Journal Agricultural Science*, 1913, vol. v., parts 3 and 4)].

MILKING MACHINES IN VICTORIA.

By R. T. Archer, Chief Dairy Supervisor, Department of Agriculture, Victoria.

There are about fourteen different makes of milking machine in this State, and as far as can be ascertained 2,000 farmers have been supplied with machines equal to 6,000 single machines or pulsators. Some of these have been put out of use for various reasons considered below. One of the principal advantages in connexion with machine-milking is that it makes a farmer practically independent of labour, which is a difficult problem in this country.

When the machines are handled properly by those who take an interest in them they give thoroughly satisfactory results; especially is this the case with

heifers first broken in to the machine. They find also that the milk keeps satisfactorily. That this should be the result with proper handling is proved by the experience at the Lady Talbot Institute. On the other hand, it is difficult, almost impossible, to persuade the average dairy farmer to exercise the necessary care in cleansing the machines, and when this is neglected the quality of the product suffers.

TYPES OF MACHINES.

All the machines but one in use in this State are worked on the vacuum principle, which is produced either by pump or by a steam-ejector. The systems in use are the bucket and the conduit or tank. In the conduit system the milk is conveyed from the teats through pipes to a tank in any convenient place, but the pipes become an additional menace in careless hands. They are of brass or gun-metal, with polished surface inside. Experiments are being made with strong clear glass tubes to replace the metal. If these prove satisfactory it will be easy to see if they are clean. In this system various valve devices are used to provide automatic release of the milk so that the vacuum may be sustained.

Another type of apparatus used for milking, which on account of its apparent cheapness and simplicity is likely to find favour with the uninitiated, consists of four ordinary milk-tubes or teat-syphons with rubber tubes attached to convey the milk to the buckets.

Many reliable users of the milking machine claim that with the machines the cows never have sore teats, and if used on a cow with sore teats they rapidly heal and do not bleed as they do when milked by hand. Some claim that contagious mammitis is more likely to spread with machines, but this only applies to the careless man.

COST OF UP-KEEP.

This varies according to care bestowed, but under proper treatment it may be put down at about £1 *per machine per annum*. Aluminium is largely used now in the teat-cups, and many of these appear to corrode rapidly at the top and bottom. Some attribute this to milk, but it is more probably due to the soda used in cleansing. It is questionable if aluminium is suitable for this purpose. Light gun-metal or brass cups nickel-plated appear to stand better.

THE SANITARY ASPECT.

The greatest problem in connexion with the milking machine as it presents itself in this country is with regard to sanitation. The difficulty is to impress users with the necessity of properly cleansing the machines as soon as possible after using. The experience gained through the Lady Talbot Institute goes to prove that with proper care milk can be produced giving an exceptionally low bacterial count.

LADY TALBOT MILK INSTITUTE.

Table showing number of micro-organisms per cubic centimetre (machine milking) :—

	1911	1912
February	9,000 ..	5,300
March	29,600 ..	21,200
April	25,400 ..	31,300
May	3,600 ..	11,600
Average	23,800 ..	18,700

Table showing average of micro-organisms per cubic centimetre after deleting the figures for the sample yielding the highest count each month. (This table gives a better idea of the bacterial condition of the bulk of milk supplied by the Institute.)

	1911	1912
February	4,400 ..	2,500
March	14,500 ..	4,100
April	20,600 ..	8,000
May	3,600 ..	9,900
Average	15,100 ..	5,600

Experiments conducted at the farm proved the superiority of the machines over hand-milking as regards cleanliness. Details will be submitted later.

(AND BUTTER RECORDS OF PURE-BRED COWS IN AUSTRALIA, VITH SPECIAL REFERENCE TO THE AUSTRALIAN BREED OF MILK-NG SHORTHORNS.

M. A. O'Callaghan, Dairy Expert, Department of Agriculture, New South Wales.

is paper showed what the Government of New South Wales and the breeders re-bred dairy cattle are doing towards obtaining the records of all pure-bred in the State.

ecords were given for Australian Dairy Shorthorns, and also a brief history formation of this breed.

ecords were also given for Jerseys and Guernseys.

LIMATE AND FOOD CONDITIONS IN RELATION TO COMPOSITION OF MILK.

e question of the effect of extreme periods of drought during which time receive no green food was referred to as affecting the solids not fat in milk. e question was also raised as to the effect on the percentage of fat in milk of t continual sunshine and absence of rainy weather coupled with good food tions, such as prevail on the irrigated lands of Yanco district, New South s.

MILK AND BUTTER RECORDS.

	Butter. lbs.	Milk. lbs.
horns (Australian type)—		
lelba III." for 9 months	585	13,818
" .. 12 ..	653	15,238
hampion III." .. 9 ..	563	10,209
.. .. 10 ..	574	10,500
ameha II." .. 9 ..	446	10,366
" .. 12 ..	524	12,089
ily III." .. 9 ..	580	14,742
.. .. 12 ..	689	17,599
ys—		
rdern's "Ledas Snowdrop" (imp.) for 7 months	518	8,079
lan's "Winsome" .. 9 ..	481	8,106
.. "Bessie" .. 9 ..	454	8,134
cdonald's "Coomassie" .. 9 ..	497	8,363
.. "Madeira VIII." .. 9 ..	482	6,685
" " " 12 ..	616	8,348
s Walker's "Lady Capture" .. 9 ..	452	6,788
" .. .. 10 ..	482	7,277
nseys—		
rry's "Mignotee VII." (imp.) for 9 months	331	5,786
" "La Colombe" (imp.) .. 9 ..	364	6,598
ross' "Merton Margaret II." (imp.) .. 7 ..	455	7,109
.W. Government's "Calm II." .. 41 weeks	503	7,548
, "Parsons' Red Rose I." (imp.) .. 51 ..	452	6,999

FLAX AS A PAYING CROP.

By C. P. Ogilvie.

ag, destined for fibre, has to be cultivated on different lines from that of eed or linseed (as it is usually called). Should seed be required, flax is thinly, about 1½ bushels per acre—by planting thinly the stem has a chance anch out and flower.

fibre is the chief object the seed is planted closer—about 2 or 2½ bushels mperial acre—the result being the drawing up of the stalks with little ten- to branch.

he total of the last available figures shows that the world's flax crop (includ- Russia for 1911) was grown on over 4½ million acres, which produced over 00 tons.

1912 Russia alone had 3,832,056 acres under cultivation which produced 71 tons, and out of this she exported 345,215 tons, realizing £11,432,954. To nited Kingdom she sent 68,500 tons, valued at £3,474,187.

* Cows marked thus were only on their second calf.

In Ireland there are nearly 1,000,000 spindles at work, over £7,000,000 sunk in mills, machinery, &c., and £5,300,000 is constantly locked up in manufactured goods. £3,300,000 is annually paid to Irish fibre workers.

It would seem, therefore, that the agricultural part of the business is assured, but it is not so.

In England and Scotland flax has almost ceased to be grown, and the acreage in Ireland has been reduced from 301,693 in 1864 to 46,921 in 1912. The acreage cultivated in 1913 was, however, increased.

Within the last two or three years great strides have been made in our knowledge, and Governments are assisting colleges and others in studying the history and habits of flax.

By constant attention and selection longer straw which will not branch until full height will be secured. A steady growth produces best fibre, and small clean stems will produce the finest filaments. The root itself has no fibrous tissues.

The fibres are surrounded by pectose, and lie in bundles containing varying numbers of filaments.

The process of separating fibre from the boon and rind has engaged many minds. Artificial means and chemistry have been employed without end. Recently a new method has been tried upon the principle of solvency under pressure, and has proved highly successful.

The old process of retting and scutching will be explained in the lecture.

Interest in the flax fibre industry has entered into a new phase of existence, with a brighter horizon.

Given suitable land, good seed, careful supervision, scientific degumming, and improved scutching, there is no reason why farmers should not devote part of their land to flax for production of fibre. It should return a better result financially, and give greater employment than any other crop usually grown.

PRELIMINARY NOTE ON WOOL INHERITANCE.

By P. G. Bailey, M.A. (Cantab.), Development Grant Research Scholar, Cambridge University.

This paper deals with the methods employed in the experiments made at Cambridge on the question of the "Inheritance of Wool Characters," and the results so far obtained from these experiments.

A cross was made between two Merino rams sent us by Mr. Harper, of Western Australia, and twenty Shropshire ewes. Thirty-one F_1 rams and forty-one F_1 ewes were obtained from this cross. An F_1 ram was mated to the F_1 ewes, and from these we have now got thirty-three F_2 rams and forty-seven F_2 ewes, but of these F_2 sheep only six rams and eight ewes have been shorn.

The methods employed in this investigation were the following:—

(1) Each sheep was given an earmark number in order that a complete pedigree should be kept.

(2) At shearing, small samples were taken from the two shoulders, neck, belly, and britch. The fleeces were then given the number of the sheep from which they came, were weighed and sent to Professor Barker at the Technical College, Bradford. They were there sorted into the commercial qualities.

(3) The commercial qualities apparently depend upon a large number of factors, each of which is possibly independent in its inheritance. These factors have been stated to be lustre, uniformity in length, waviness, and, most important of all, average diameter of fibre. Consequently it became necessary to analyze these factors separately. With Mr. F. L. Engledow's help, a microscopical investigation has therefore been made into these characters, especially as regards average diameter of fibre.

Results so far obtained:—

(1) Range of qualities shown by Bradford sorting:—

Merino rams	Quality	64^s
Shropshire ewes	,,	54^s–50^s
F_1 rams	,,	60^s–44^s
F_1 ewes	,,	60^s–50^s
F_2 rams	,,	60^s–54^s
F_2 ewes	,,	60^s–54^s

There is, in fact, a high range of variation in the F_1 generation, but the great bulk of the F_1 sheep are of a quality intermediate between that of the Merino and Shropshire parents.

(2) No accurate investigation has yet been made into the amount of grease in fleeces, but it was seen that the F_1 generation were intermediate in this respect between the two parents.

(3) The microscopical investigation of the average diameter of the fibres points to the fact that the great bulk of the F_1 sheep are intermediate as regards *this character.*

It has incidentally been shown that in order to obtain a probable error of less than 3 per cent. of the average of any sample it is necessary to take 160 measurements of that sample.

(4) There is a large variation in the range of the weights of the F_1 fleeces.

(5) The F_1 generation are also intermediate as regards the number of waves per inch.

TWO MAPS ILLUSTRATING THE FERTILITY OF LOWER EGYPT.*

By H. T. Ferrar, M.A., F.G.S.

In an arid country water supply is the most important factor governing the fertility of the soil, and, given a sufficiency of water, the origin or the chemical composition of the soil is usually of secondary importance. Evaporation being active under arid conditions there is a tendency for salt to accumulate in the soil to the detriment of agriculture. In the United States of America much arable land has deteriorated owing to the accumulation of salts caused by injudicious irrigation, and the next step in Egypt's agricultural progress is the provision of a widespread and efficient network of drains.

The programme of this work is now in hand, and, in order to be in a position to assess the improvement effected after the improved drainage facilities begin to operate, the Egyptian Survey Department was asked to make a survey which would record the present condition of the land. A Fertility Map of part of the Northern Delta is shown. The map on a scale of 1÷50,000 is reduced from the 1÷10,000 field-sheets of Mr. F. E. Frith and myself, which are coloured according to an eye-estimate of the value of the land. The agricultural value has been proved to depend upon the salt-content of the soil, and in order to control the arbitrary scale adopted frequent soil-samples have been analyzed by Mr. F. Hughes, of the Agricultural Department. The mean salt-content of what we have called good land (coloured yellow on the map) is about 0.3 per cent., medium land (burnt sienna) about 0.5 per cent., poor land (sepia) 0.8 per cent., and barren or uncultivated land (purple) 1 per cent. to 20 per cent.

On comparing this map with another on the same scale showing the contours it is noticeable how the fertility depends upon both absolute and relative levels, *i.e.*, upon natural drainage. The good land occurs in the south, and becomes gradually inferior, and finally barren as sea-level is approached, except for narrow strips along the high-lying arterial waterways.

Canals such as these, though sometimes following a tortuous course, are always the most satisfactory, firstly, because they easily command the country they serve with irrigation water, and, secondly, because the evils of salt accumulation consequent on active infiltration are reduced to the lowest possible minimum. Conversely drainage channels are not fully efficient unless they follow closely the lowest parts of depressions between opposing elevations. In Egypt differences of level are usually comparatively small; nevertheless, remodelling of water channels, which in the old days were not excavated acording to the contours, has formed part of the irrigation programme since the British occupation of that country.

It is understood that some Australian irrigation projects have not been entirely successful owing to difficulties such as are indicated, and it is urged that it is an economy to spend money on detailed mapping of new country before launching on projects of canalization, which if lacking in finality may entail a greater outlay on remodelling than would have been needed for the initial survey.

"When we mean to build,
We first survey the plot, then draw the model."

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* By permission of the Director-General of the Egyptian Survey Department.

SOME FACTORS CONTROLLING THE GROWTH OF COTTON.*

By H. T. Ferrar, M.A., F.G.S.

Among the main factors which control the cultivation of cotton on a commercial basis are:—(1) Temperature, (2) water supply, (3) soil, (4) labour.

(1) The cotton plant is commonly found in those parts of the world which lie within thirty degrees of the Equator, but finds its best development in what may be described as sub-tropical climatological regions. In Egypt the air temperatures which rule at sowing time are in the neighbourhood of 65° F.; as the plants attain maturity the temperatures gradually rise to values of 82° F. and 83° F. and fall some 9° or 10° during harvest.

(2) The water requirements of the crop are equivalent to about 46 inches of rainfall, which in Egypt is met by irrigation from perennial canals. The water factor naturally depends upon environment. The methods adopted by the Egyptian cultivators are described.

(3) The volume (depth) of soil available to the roots of the cotton plant is of more importance than its texture or its chemical composition, provided always that the soil contains sufficient available plant foods. In Egypt cotton is grown profitably on a soil, which in one extreme case is an almost pure sand, and in the other extreme an unctuous clay. Diagrams are exhibited showing how a high water-table, by reducing the volume of available soil, limits the yield of the plant.

(4) The profits derived from the cultivation of cotton naturally depend upon the cost of agriculture. Where the price of labour is high better returns are obtained by cultivating the more valuable types of cotton. The higher grade Egyptian cottons grow best in the Delta, while warmer Middle Egypt supples a cotton (*Ashmuni*) whose fibre is of medium value only.

The East Coast of Australia would seem to provide the requisite temperatures and rainfall necessary for cotton cultivation, but widespread experiment is necessary if it is desired to prove what areas provide suitable soil conditions and what is the margin of profit of the husbandman.

THE CAPILLARY POWER OF SOILS.

By Heber Green, D.Sc.

The conventional mechanical analysis supplies data about the sizes of the particles of the soil: the information actually required concerns the behaviour of the soil with respect to the movements of air and water therein. These latter are dependent on the sizes and distribution of the free spaces between the particles and only indirectly on the sizes of the particles.

This suggests a direct measurement, if possible, of the factors determining these physical characters and conditions of the soil, and the magnitudes to be considered are:—

S, the pore space, expressed as a fraction of the total volume of the soil: and θ, the water-content, similarly expressed. θ/S is then the fractional saturation of the soil.

P_a and P_ω, the permeabilities to air and water. Incidentally the ratio of these two gives us an indication of the amount of colloidal matter present in the soil and of its tendency to swell when wet.

K, the capillary power. This taken with the previous factors gives a measure of the rate at which water will percolate from a wet to a dry region in the soil.

These factors (S, θ, P, and K) have been previously defined and methods for their measurement described.†

Of these S, θ, and P are simple properties with obvious physical meanings, but K (the capillary power) is of a more complex character and may be defined as the pull per unit area which the soil can exert on a layer of water in contact with it. This capillary power will obviously depend on the water-content of the soil: when $\theta/S=1$, then $K=0$: the maximum value of K being reached when $/S=0$, *i.e.*, when the soil is dry.

The value of K between any given limits of θ/S becomes of practical importance, for under field-conditions soils are rarely absolutely dry or completely saturated, and the water-movements with which we are most concerned are from relatively moist to relatively dry sections.

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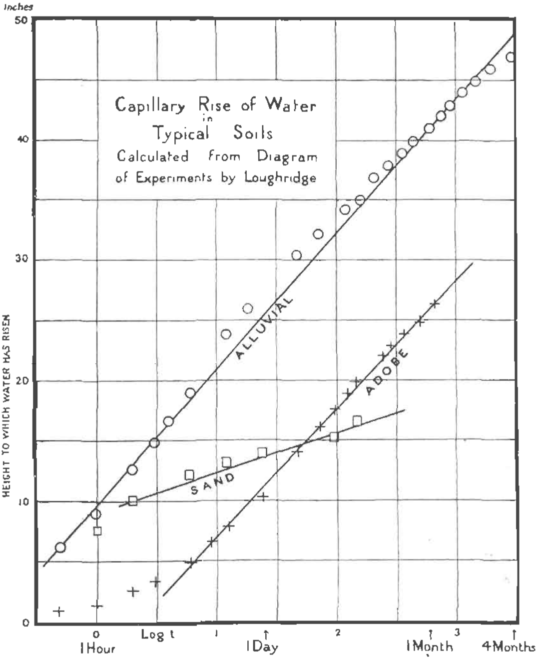
* By permission of the Director-General of the Egyptian Survey Department.

† Heber Green and G. A. Ampt, *Jour. Agr. Sci.*, 1911, 4, p. 1.

This capillary power is due to the surface-tension effects produced by the attraction between the walls of these capillary pores and the water in the soil, and may be most conveniently studied by considering a vertical column of soil with its lower end placed just in contact with a free surface of water. It has previously* been shown that such a column of soil will behave (statistically speaking) as a bundle of capillary tubes, varying from a maximum radius depending on the size of the largest soil-grains down to others extremely minute. The water will rise in each capillary to a height inversely proportional to its radius, equilibrium being



rapidly attained in the larger tubes; but, as the frictional resistance varies inversely as the fourth power of the radius, the rate of rise in the smallest tubes will steadily slacken but will not absolutely cease within any finite time.

This rise without limit is in conflict with the generally accepted opinion, and Hilgard† quotes a series of experiments by Loughridge, in which the final heights recorded (after several months) are regarded as maxima for the soils concerned. The rate of rise in his experiments may be shown to be inversely proportional to the time; *i.e.*, $dh/dt=k/t$ or $h=A+B \log t$. From the examples illustrated in

* *Loc. cit.* † *Soils*, p. 205.

the graph in the accompanying diagram it is clear that any apparent limit to h within a reasonable time or variation from a linear function can only be due to initial disturbances or other accidental errors.

With a view to a further and more accurate investigation the author has arranged a laboratory draught-cupboard so that it can be maintained at a constant temperature for several months at a time.

Experiments have been carried out on the rate of rise of water in soils of different types; and the dependence of K (the capillary power) on S and θ/S and on the sizes of the soil-grains has been investigated.

THE SOIL MOISTURE PROBLEM IN WESTERN AUSTRALIA.

By John W. Paterson, B.Sc., Ph.D., Professor of Agriculture, University of Western Australia.

A sufficient supply of soil moisture was, practically speaking, the paramount factor in crop production. This was true in the relatively moist climate of Great Britain; the fact was illustrated in an extreme degree in Australian agriculture. Seasonal variations were less marked in Western Australia than in the Eastern States, and a graph was exhibited showing the variations in wheat yields per acre of the various States since 1901. The effects of drought were not simply connected with the annual rainfall of a locality. This was a popular fallacy; but when a crop suffered from drought the result was contributed to by quite a number of factors. Among those he would mention—(1) the total annual rainfall, (2) its monthly distribution, (3) the rate of evaporation as from a free surface of water, (4) the effect of climate upon the transpiration ratio of the crop, (5) the amount of soluble salts in the soil, (6) the physical character of the soil, (7) the skill in cultivation of the farmer, (8) the selection of drought-resistant species and varieties of crop-plant. In regard to annual rainfall, the South-Western corner of the State averaged well over 30 inches, but on the Eastern fringe of the wheat belt wheat could be successfully grown with a 10-inch rainfall, but the greater part of the wheat area had an average of 14 to 20 inches. To visitors these amounts would seem low. The monthly distribution, however, was highly advantageous, as from 70 to 80 per cent. fell between an autumn seed-time and harvest. The third factor, viz., rate of evaporation, tended, however, against success, and data were quoted from the Commonwealth Weather Bureau showing that the annual loss by evaporation in the wheat belt ranges from 60 to 80 inches of water, as against about 20 inches in the South of England. In England therefore the annual evaporation would amount to about two-thirds of the annual rainfall, while in the chief farming districts of Western Australia it was from four to six times greater than the rainfall. Closely connected with this in some, but not all, of its contributing causes was the lower efficiency of water to the growing crop, as indicated by the amount required to produce a given weight of dry plant substance. The transpiration ratio was indeed less a function of the kind of crop (speaking of the common crops) than a function of the climate, and the author quoted from experiments he had carried out showing that on land of moderate fertility a ratio of 600 to 700 would be required for the wheat areas. This was roughly double the English ratio. Again, as regards soluble salts, the drier areas commonly held a slightly higher percentage than British soils, and while in Western Australia "alkali" rarely of itself caused infertility, his experience of alkali lands, which he had investigated for the Victorian Government, indicated that such salts increased the liability of crops wilting. On consideration they would expect this. Again, the physical character of the soil had an important effect, and the sandy character of much of the western lands gave it an advantage over the heavier soils in a dry season. This was contradictory to his experience in the English Midlands with a 32-inch rainfall. Fifteen inches of rain absorbed by the surface five feet of soil would add something less than 20 per cent. of water calculated on the dry soil if it were absorbed without loss. But the annual rainfall was spread over several months, and the fact seemed to be that with a 15-inch rainfall the sandy soil could hold all the rain which fell, and the greater absorbent power of the clay soil was then of no advantage. It was indeed a disadvantage, as the finer-grained soil could not yield up so much of its absorbed water before wilting set in, and in the drier seasons and districts the "sand plain" gave superior results to the forest land. In regard to cultivation methods, the author quoted figures

from his experiments showing the large saving of soil moisture by early cultivation and maintaining a soil mulch. The water saved would usually equal from 5 to 7 inches of rain in the surface five feet of soil. In Western Australia good results from fallowing were more easily obtained than in Victoria, where the more frequent summer rains tended to cake the surface, rendering fresh working of the land necessary. The water saved showed itself in the crop yields, and the results of a Kellerberrin farmer last season, showing 17 bushels on sand plain fallowed, and 5 bushels on similar land ploughed from stubble, could be regarded as typical under a 12-inch rainfall. The British farmer did not sufficiently realize the use of the soil mulch in protecting his winter ploughed lands from the drying winds of spring. Lastly, as to the selection of drought-resistant plants, much had been done through acclimatisation, selection, and cross-breeding, but a careful analysis of the various factors which in wheat constituted drought-resistance remained to be carried out before they could claim that plant-breeding for this object was placed on a scientific basis. Under the dry conditions of *Australian wheat-growing a safe yield rather than a heavy yield was the primary* consideration. This necessitated the selection of early or middle-early varieties, thin seeding, and in the great majority of cases the non-use of nitrogenous manures.

THE TEN INCH LINE OF RAINFALL.

By Thomas Cherry, M.D., M.S., Professor of Agriculture in the University of Melbourne.

The relative importance of Australia in regard to the future food supply of the world is influenced to a very marked degree by its average winter temperature and the peculiar incidence of the rainfall throughout the southern third of the Continent. In these regions the term "dry farming" has a different meaning from that accepted in the Northern Hemisphere, on account of the fact that our rainfall is almost exclusively of the winter type, and that the winter temperatures are high enough to keep the ordinary cereals growing steadily during these months. Consequently, before the dry summer sets in the crops have *reached a sufficient degree of maturity to complete their ripening before the soil* has become too dry to arrest all further growth.

Graphs were shown illustrating typical rainfall records in the region of the winter rains in all the States of the Commonwealth except Queensland and the Northern Territory. A brief comparison was made with the limited areas in other parts of the world which are similarly situated.

As a result of these conditions it may be said that in the southern parts of the whole of Australia "dry farming" does not begin until the 15-inch line of rainfall is passed, because the winter and the total rainfalls are nearly identical. The experience of the last fifteen years has shown:—

(1) That with the assistance of small amounts of soluble phosphates profitable crops may be grown on less than 10 inches of winter rainfall.

(2) Provided the land is fairly fertile rapid growth takes place in July and August, so that a considerable margin is available in autumn for early and late planting.

(3) The dry weather towards harvest-time materially reduces the risk from all fungus diseases in cereals.

(4) Wherever wheat can be grown peas may also be grown if necessary as an alternate crop.

(5) Evaporation in winter is comparatively small, and consequently by fallowing and other modern methods a payable crop is obtained on a lower rainfall than is the case in any other part of the world.

(6) The slight ground frosts which often occur in the winter nights appear to stimulate the growth of the cereals when followed by ten hours of bright sunshine.

(7) The chief problem which has now to be solved is to devise methods by which large numbers of sheep and cattle can be profitably kept on the wheat farms in the 10-inch rainfall regions.

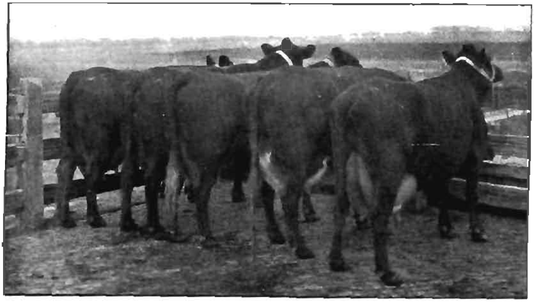
(8) Lands originally covered with scrub and producing very little grass have been proved to be very suitable for wheat. With the gradual advances in the numbers of stock kept on these farms permanent agricultural settlement is likely to extend well beyond the 10-inch line of rainfall.

RED POLL DAIRY CATTLE.

Report on the Departmental Herd for the Season 1913–14.

By R. R. Kerr, Dairy Supervisor, Central Research Farm, Werribee.

The great scarcity of beef cattle and the high prices paid for them has turned the attention during recent years of many cattle breeders to the evolution of a breed that would be a first-class beef animal and at the same time a profitable dairy cow. While this so-called dual purpose cow may be something of a myth, it cannot be denied that individual strains in various breeds do possess these characteristics, and concerted action by the breeders, with special regard to selection, must ultimately bring success. Some breeds come much nearer the ideal than others—no one would call the Jersey a beef animal, nor the Aberdeen Angus a profitable dairy breed.



A Deep-milking Quintet.

"Sumatra." "Vuelta." "Europa." "Bullion." "Maria." (See Yield Records, p. 537.)

All breeds of cattle have their place in farm husbandry; special dairy breeds are wanted on the smallest farms, but to the dairy farmer who has a large farm, some attention should be given to the beef-producing interest, as well as to the milking qualities. The prices of young steers will tend to force attention on this subject. Very many farmers say, "If dual purpose cows possess such great merit, why are not more bred in the country?" I believe there is a logical answer to this question. We must realize that the price of land has doubled in recent years, and wages are higher, so we have to keep cattle to utilize our fodder crops and at the same time maintain the fertility of the soil. We want a cow to reproduce herself each year, and to produce milk and butter for market, then finally sell her to the butcher at a good price. The special dairy cow has been developed under more artificial conditions both as to feed and care, and calls for more knowledge than the average farmer will give her. I believe that the strictly dairy cow is pre-eminently

adapted for dairy purposes, and to such purposes alone, but the average farmer wants an animal that gives a satisfactory amount of milk and butter, produces a good steer, and after serving her usefulness in that direction can be turned into a very acceptable quality of beef. In the opinion of the writer, the greatest success will come to the breeder who treats his dual purpose cattle primarily as dairy cattle, but who breeds for size and flesh making.

The Red Poll has the double purpose tendencies in a marked degree, their fineness of bone and large amount of flesh make them an animal much sought after by butchers, and they show a readiness to fatten not excelled by any other breed. Their capacity as milk and butter producers is attested by the many fine records established by the herds under the auspices of the British Red Poll Association, and as will be seen by perusal of the records of the Government herd for the past four seasons, they compare not unfavorably with the best of the other dairy breeds in the State.

The Wisconsin Experimental Station in America, and the Hawkesbury College, in New South Wales, have after many years of experience

The Werribee Herd of Red Polls at Pasture.

decided on the Red Poll as the general purpose breed to foster, and both institutions have recently established a stud herd of these cattle.

Previously the Red Poll was looked upon only as a beef animal, but if we follow the earliest writings on the breed, we find them noted for the richness of their milk and the great length of their lactation period. They follow close up to the Jersey and Guernsey in richness of milk, as the tests in these returns will show, with an average test from the herd during the recent four years of 4.4—4.7—4.8—4.5, the corresponding milk yields being 575—635—594 and 667 gallons per cow.

Red Polls are greatly in demand in the northern States, the bulls being used for crossing purposes with the Shorthorns and other cattle. A draft of ten rising two-year-old bulls from the herd of Major Philip Charley, of Belmont Park, Richmond, N.S.W., was sold by auction at the Brisbane Royal Show in August this year, and averaged 51 guineas per head. Their rich red colour blends well with the other breeds, and the absence of horns from the resultant progeny reduces the cost of handling them, as hornless cattle are more docile, and consequently fatten quicker. A visit to the herd at the Research Farm will convince one as to their

docility, as nearly all the cows can easily be handled, which makes them well adapted to trough feeding in the open paddocks. Hornless

The Practical Advantage of Hornlessness.

Red Poll cows packed close and contentedly feeding on green lucerne from a rack.

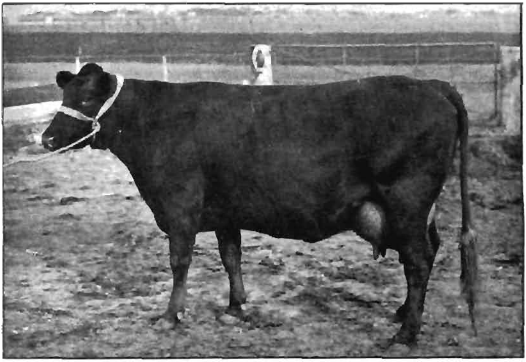
The Leading Sire in the Werribee Herd.

"Nicotine," 3 years, by "*Acton Dewstone*" (imp.), ex "*Chessie*," by "Magician" (imp.); bred by Major Philip Charley, N.S.W.

cattle only need half the space required by horned animals, and udder *injuries are very rare; one outstanding feature in the Werribee herd*

is that every cow is sound in her udder and free to milk. The young bulls are in demand by the dairymen of the State, at prices based approximately on the butter fat record of the dam, at 1s. per lb. of butter fat yielded. All last season's drop were sold some time ago. and many of this season's calves are already bespoke. Good reports are to hand of the progeny of bulls sold a few years ago.

As to their lactation period, one month was the average spell for each cow — "Netherlana," a heifer, milked right up to calving, and gave 10 lbs. of milk a day when recalving, immediately increasing to 32 lbs. daily. "Vuelta" was dry one week.

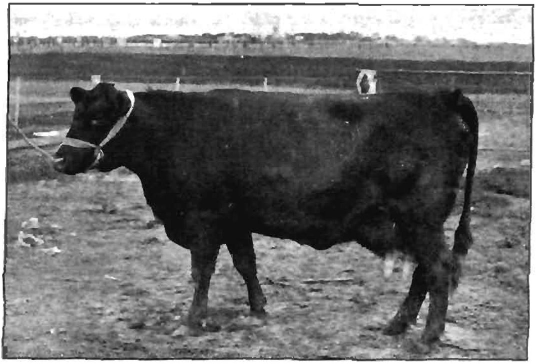


"Vuelta."

First and Champion, Melbourne Royal Show, 1913, giving 4½ gallons daily, *after recovery from milk fever.*

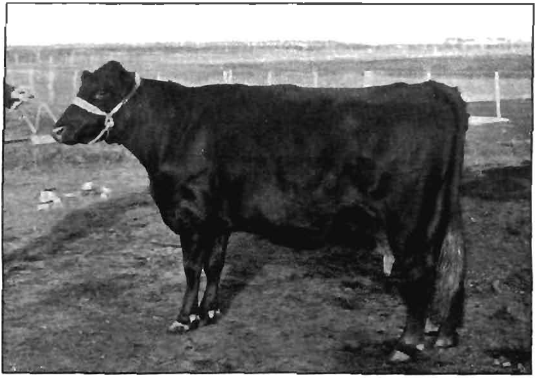
"Persica" and "Birdseye" were giving 19 lbs. daily at the end of their term, and extreme measures were taken to complete their drying. While four weeks was the term of dryness, better results would follow from a spell of at least six weeks. The herd was removed in December in a low yielding condition from the dry pastures of Boisdale to Werribee, and liberal feeding on green lucerne and oaten chaff checked the decreasing yield, so that they completed the season well, maintaining their former reputation as one of the best yielding stud herds in Victoria.

Year.	Yearly Averages.						
	Cows in Herd.	Days in Milk.	lbs. Milk.	Test.	lbs. Fat.	lbs. Comm. Butter.	Values at 1s. for fat.
							£ s. d.
1910–11 ..	12	261	5,750	4·4	255	291	12 15 0
1911–12 ..	13	283	6,350	4·7	304	346	15 4 0
1912–13 ..	14	267	5,921	4·8	260	295	13 0 0
1913–14 ..	22	285	6,564	4·5	297½	338	14 17 0



"Goldleaf."

Gave 308.5 lbs. butter fat (351½ lbs. commercial butter) on her first calf, and gained 5th place amongst heifers of all breeds in the Government Standard Test, 1913-14. Gained 2nd prize and Reserve Champion, Melbourne Royal Show, 1913.



"Europa."

Third Prize, Melbourne Royal Show, 1913.

The average butter fat return for twenty-two cows is 297 lbs., at 1s. per lb., £14 17s., and for six heifers, 194 lbs., £9 14s. It will be

noticed that "*Cigarette*," "*Muria*," "*Birdseye*," "*Vuelta*," *and* "Bullion" have reached 400 lbs. of commercial butter, while "Atlanta," a heifer, gave 315 lbs. commercial butter.

The relative positions of the cows in this herd of Red Polls compared with the herds of other dairy breeds competing in the Government Standard Test is interesting. In the all-aged section the twenty-third position, held by "Muria," is creditable, though not very distinctive, but it is definitely encouraging to find that two of the younger animals bred by the Department—"Goldleaf" and "Birdseye"—occupy respectively fifth place amongst heifers and sixth place amongst four-year-olds of all breeds. Two other four-year-olds—"Persica" and "Mexicana"—are eighth and ninth respectively in the same class.

"Asiana," a very large rich-coloured cow, with a splendid vessel, dropped a bull calf weighing at birth 125 lbs. live weight, and one

"Sumatra."
Giving 5½ gallons daily on fifth calf.

month after calving was yielding daily 4 gallons of milk with a test of 5.28 per cent.

The Government cheese expert, Mr. Sawers, when making experimental cheese at the farm, expressed the opinion that the Red Poll milk was the best he ever handled for cheese making, and on one occasion 50 gallons of milk produced a 60-lb. cheese, which at 7d. per lb. means a value of over 8d. per gallon for cheese making, and the value of the whey still on hand.

The dairy type is strongly in evidence, as can be seen by the accompanying illustrations, and the evenness of form and similarity of appearance is a puzzle to the newcomer in distinguishing one cow from another.

"Nicotine," the bull now at the head of the herd, is a very quiet, good-tempered animal, with well sprung ribs, level back, and deep barrel, nice bright eye, rich skin, pronounced rudimentary teats, and

comes from a good producing cow. The young calves are of good type and fine boned and well teated, showing every promise of making good dairy animals.

The young bulls from these selected, high-testing cows should have a dominating influence over many herds in the State and considerably increase the productivity of the resultant progeny.

DAIRYING POSSIBILITIES AT WERRIBEE.

The establishment of a dairy herd at the central farm and the *results obtained point to great dairying possibilities under irrigation in* the Werribee district. The recent tests and weights of milk compare with the best Western District returns, and the proximity to Melbourne should be an important factor in inducing dairymen to settle on the irrigation blocks and supply whole milk to Melbourne at the periods of greatest scarcity. Land that will produce 6 tons of lucerne hay to the

"Mexicana."
Giving 5 gallons daily on her third calf.

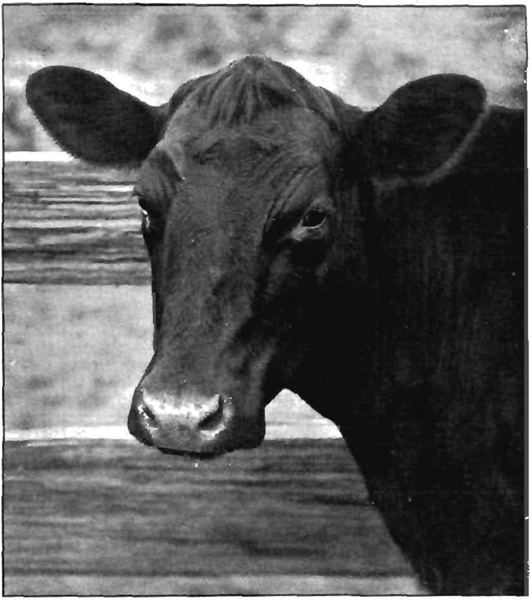
acre is well suited for dairying. Peas, beans, and other legumes grow well, and by feeding the fodder to cattle, the humus will be returned to the soil.

SOME JULY RETURNS.

Daily averages over one week.—"Muria," 56¾ lbs.; "Mexicana," 50¼ lbs.; "Sumatra," 48¾ lbs.; "Virginia," 48½ lbs.; "Cuba," "Vuelta," "Turka," "Phillipina," and "Pennsylvania," all with daily averages of over 4 gallons; while "Bullion," freshly calved, is giving over 50 lbs. daily; and "Europa" and "Goldleaf" show promise of heavy yielding.

All cows calving (namely, twenty-two), since April were in the middle of July yielding, on an average, 35 lbs. of milk a day, while *the whole herd, including strippers, was averaging 28 lbs. a day.*

The herd at Werribee soon settled down to hand feeding—their docility was largely accountable for this—very little digestive troubles were experienced, and the splendid condition of the animals is ample testimony as to their fitness for the purposes intended. The cows were well fed in the period elapsing between their drying and re-calving, and all are coming in showing promise of heavy yielding this year. Many dairymen do not treat their dry cows in a proper manner, the general



"Netherlana's" docile countenance.

idea being that the out-of-milk cow does not need good feed. This is a foolish practice, the springing cow has to build up her body to withstand a heavy milking period and also nourish the unborn calf; should the food supply be restricted, both cow and calf suffer. The calves born at Werribee this year were in splendid condition.

The development of the herd in so short a time—as only five years have elapsed since it was founded—speaks volumes for the dairying qualities of the breed, which is destined, I think, to become very popular in Victoria, not as a particular hobby or fancy, but as an actual benefit to the dairying industry in this State.

YIELDS AND RETURNS OF THE GOVERNMENT HERD OF RED POLL DAIRY CATTLE.

Season 1910–11.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.		
							£	s.	d.
Vuelta	270	38½	5,569	7·0–7·8	405·14	461¾	20	5	1
Bullion	283	40½	7,730	4·2–5·0	356·71	406½	17	16	8
Connecticut ..	283	40½	8,180	4·2–4·6	260·06	306¾	13	9	0
Virginia.. ..	283	40½	6,360	3·8–4·6	254·75	290½	12	14	9
Carolina ..	283	40½	5,700	4·2–4·8	253·14	288½	12	13	1
Muria	283	40½	5,480	4·2–6·2	240·70	274¼	12	0	8
Cuba	283	40½	5,269	4·2–4·8	231·89	264½	11	11	11
Havana ..	283	40½	5,750	3·8–4·6	229·97	262¼	11	10	0
Kentucky ..	245	36½	5,310	4·0–4·6	225·98	257½	11	6	0
Cigarette ..	238	34	5,049	4·0–4·6	211·61	241½	10	11	7
Beulah	135	19¼	3,970	4·2–4·9	200·44	228½	10	0	5
Pennsylvania ..	*270*	*38½*	*4,610*	*4·0–4·4*	*189·75*	*216¼*	*9*	*9*	*9*
Average for 12	261	37½	575·0	4·4	255·77	291½	12	15	9

Season 1911–12.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.		
							£	s.	d.
Vuelta	289	41¼	7,750	5·2–8·2	485·1	553	24	5	1
Connecticut ..	283	40½	6,780	4·6–6·4	364·0	415	18	4	0
Bullion	305	43½	6,940	4·8–6·2	344·0	392½	17	4	0
Beulah	278	39¾	6,460	4·9–6·4	342·0	390½	17	2	7
Cuba	304	43½	7,015	4·4–8·4	337·8	385	16	17	9
Cigarette ..	291	41½	6,480	4·0–5·6	285·9	326	14	6	0
Sumatra ..	293	42	6,660	4·0–5·0	284·2	324	14	4	1
Kentucky ..	277	39½	6,690	4·0–4·8	277·7	316½	13	17	8
Muria	286	41	5,800	4·5–7·0	275·7	314¼	13	15	8
Pennsylvania ..	318	45½	6,340	4·0–5·2	271·9	310	13	12	0
Carolina ..	226	32¼	5,800	4·0–5·0	254·3	280	12	14	4
Virginia.. ..	277	39½	5,510	3·9–4·6	221·7	252¾	11	1	9
Havana ..	262	37½	5,350	3·8–4·5	215·3	245½	10	15	4
Average for 13	283	40½	635·5	4·7	304·6	346¼	15	4	7

Season 1912–13.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.		
Cows.									
							£	s.	d.
Muria	256	36½	5,780	4·5–7·3	314·96	359	15	15	0
Bullion	239	34	6,490	3·8–6·8	296·90	338½	14	16	10
Egypta ..	295	42	6,581	3·7–5·2	283·5	323	14	3	6
Virginia.. ..	259	37	6,500	3·6–5·7	282·56	322	14	2	6
Cigarette ..	273	39	6,810	3·9–4·8	278·56	317½	13	18	6
Connecticut ..	320	45¾	6,100	4·0–7·6	277·85	316¼	13	17	10
*Vuelta ..	263	37½	6,650	3·5–5·3	273·81	312	13	13	9
Cuba	251	36	6,280	3·9–5·4	269·11	306¾	13	9	1
Kentucky ..	267	38	6,249	3·4–4·4	256·00	291¾	12	16	0
Havana ..	258	37	6,060	3·5–5·5	252·95	288½	12	12	11
Sumatra ..	230	33	5,670	3·7–5·5	238·37	171¾	11	18	4
Pennsylvania ..	230	34½	4,910	3·8–5·9	215·09	245½	10	15	0
Europa	324	46¼	4,590	3·6–7·1	201·13	229¼	10	1	1
Carolina ..	274	39	4.450	3·6–6·5	198·30	226	9	18	3
Average for 14 Cows ..	267	38	59·42	4·85	259·94	295	12	19	10

* Suffered from eye accident for a considerable period.

Season 1912–13—*continued.*

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
				Heifers.			
							£ s. d.
Goldleaf ..	287	41	6,590	4·1–5·3	316·50	360	15 16 6
Birdseye ..	285	41	4,440	3·9–8·0	256·75	292½	12 16 9
India	267	38	5,231	4·1–6·2	238·37	271½	11 12 1
Persica	252	36¼	4,106	4·6–7·7	218·69	249¼	10 18 8
Turka	191	27½	3,593	4·6–5·9	178·27	203½	8 18 3
Mexicana ..	210	30	3,830	4·0–5·1	171·58	195½	8 11 6
Regalia ..	338	48¼	3,380	4·4–6·0	161·58	184¾	8 1 0
Cabana	273	39	3,370	4·0–5·4	153·23	174½	7 13 3
La Suelta ..	241	34½	2,660	4·3–8·2	134·23	153	6 14 3
Average for 9 Heifers	260	37	413·2	5·3	203·24	232	10 3 3

Season 1913–14.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Estimated Butter (lbs.)	Values.
				Cows.			
							£ s. d.
Cigarette ..	328	46¾	9,414¼	4·12	388·25	442½	19 8 3
Muria	296	42¼	7,487¼	5·08	380·25	433¼	19 0 3
Birdseye ..	297	42½	6,542¾	5·48	358·75	409	17 18 9
Virginia ..	304	43½	8,229	4·33	356·75	396¾	17 16 3
Bullion	297	42½	8,177¾	4·29	350·75	400	17 10 9
Sumatra ..	330	47½	7,605	4·26	323·75	368¼	16 3 0
Vuelta	286	43¾	7,723½	4·14	320	364¾	16 0 0
Connecticut ..	278	39¾	7,166	4·47	318·25	362¾	15 18 3
Persica	298	42½	6,954¼	4·57	318	362½	15 18 0
Kentucky ..	238	39¾	7,904½	3·96	313·25	357	15 13 3
Goldleaf ..	277	41	6,908	4·49	310·25	353½	15 10 3
Mexicana ..	293	*41*	*6,773¾*	*4·56*	*309·25*	352¼	*15* 9 3
Cuba	237	41¾	6,624¼	4·47	296·25	337¾	14 16 3
Europa	302	43	6,273	4·60	289·25	329¾	14 9 3
Egypta	288	41	6,724	4·13	277·75	316¾	13 17 9
India	245	35	6,150	4·36	268·5	306	13 8 6
Havana ..	240	34½	6,364½	4·15	264·25	301¼	13 4 3
Turka	289	41¼	5,534¼	4·69	259·75	296	12 19 9
Asiana	260	37	4,249¾	5·30	225·5	257	11 5 6
Pennsylvania ..	249	35½	5,160	4·4	212·25	242	10 12 3
Regalia	297	42½	4,444	4·50	200·25	228¼	10 0 3
Carolina ..	231	33	*4,322½*	*4·62*	*200·25*	228¼	*10* 0 3
Averages of herd of 22 cows ..	284¾	40¾	6,669¾	4·49	297·25	338½	14 17 3
				Heifers.			
Atlanta ..	300	42¾	5,505¼	4·90	277	315¾	13 17 0
Germania ..	359	51½	4,218¾	4·74	199·75	227¾	9 19 9
Arctica	294	42	*3,768¼*	*5·16*	*194·5*	221¾	*9 14 6*
Netherlana ..	293	41¾	4,551¼	4·18	190·5	217¼	9 10 6
Hispana ..	290	41¼	3,944½	3·95	155·75	177½	7 15 9
Melanesia ..	276	39½	3,690½	3·97	146·5	167	7 6 6
Averages for 6 heifers ..	302	43¼	4,279¼	4·48	194	221	9 14 0

MILLING AND BAKING QUALITIES OF VICTORIAN WHEAT.

By A. E. V. Richardson, M.A., B.Sc., P. R. Scott, and F. G. B. Winslow.

In pursuance of the policy adopted last season, the standard f.a.q wheats fixed by the Chambers of Commerce of the four wheat States of the Commonwealth were first examined in order to establish a basis of comparison for locally-grown pure types, and also to secure a definite analysis of the f.a.q. samples from year to year.

These f.a.q. standards are at the present time fixed each season by the Chambers of Commerce, and are alleged to be a fair average of the wheat of the State. The standard is a composite sample obtained by mixing a large number of representative samples from the principal wheat-growing districts in each State in parts proportional to the production of each district.

The method of examination was, with few exceptions, similar to that adopted last season. The amount and kind of each type of impurity present in standard sample was first obtained, and the percentage of the various sizes of grain composing each sample.

For the determinations of impurities 2,000 grams of wheat were used. Table I. summarizes the results:—

Table I.

Showing Amount of Impurities in f.a.q. Standard Wheat of New South Wales, Victoria, South Australia, and Western Australia, Season 1913-14.

(Per 1,000 Grams.)

—	New South Wales.	Victoria.	South Australia.	Western Australia.
1. Oats	0·73	0·29	0·37	0·47
2. Wild Oats	1·61	0·85	1·05	0·04
3. Barley	0·42	1·08	2·68	1·02
4. Drake	0·11	0·71	0·62	0·81
5. Straw	1·50	2·37	1·17	0·76
6. Chaff	0·97	1·60	2·08	1·66
7. White Heads	0·02	0·02	0·04	0·04
8. Weed Seeds	0·19	0·11	0·21	0·02
9. Bunt	0·28	0·36	0·42	0·50
10. Rubbish	1·29	0·47	0·51	0·82
Total	7·12	7·86	9·15	6·14
Percentage of Impurities, 1913–14 ..	·71	·79	·92	·61
" " " 1912–13 ..	·37	·74	·77	—

This is the first occasion on which the Western Australian f.a.q. sample was tested. On comparing the results with last season, it will be noted that all States showed increases in impurities on last year's figures. Thus, the percentage in New South Wales rose from .37 per cent. to .70 per cent., South Australia from .77 to .92 per cent., whilst Victoria's percentage was practically stationary, viz., .78 per cent. as against .74 per cent in 1912. If we assume an export of 20,000,000 bushels each from New South Wales and Victoria, and 10,000,000 bushels from Western Australia and the same quantity from South Australia for the past season, the amount of impurities exported with the wheat crops for the past season is approximately 12,000 tons, the freight of which would amount to £18,000. All the f.a.q. samples contain bunty grains in proportions larger than last year, a regrettable feature in view of the fact that the ravages of this fungus pest can be controlled by the simple process of pickling.

The *cleaned f.a.q. samples* were next submitted to careful grading by means of specially-constructed hand sieves, the respective meshes being 3.25, 3.00, 2.75, 2.50, 2.25, and 2.00 millimetres. Such an analysis reveals the physical constitution of each sample of grain, and the relative amounts of plump and shrivelled kernels making up the standard. Well filled plump grain is better for milling purposes than small and shrunken grain, mainly because of the fact that the former readily yields a much higher percentage of straight grade flour than the latter. Table II. summarizes the results:—

Plate 1.—Different grades of wheat.

(1.)—Over 3·25 mm. (2.)—3 mm. (3.)—2·75 mm. (4.)—2·5 mm. (5.)—2·25 mm. (6.)—2mm. (7.)—Screenings.

TABLE II.

SHOWING AMOUNT OF GRAIN RETAINED IN F.A.Q. SAMPLES BY SIEVES OF VARYING MESH.

Diameter of Sieve.	New South Wales.	South Australia.	Western Australia.	Victoria.
3.25 m.m.	24.50	22.50	19.25	22.50
3.00 "	185.25	126.50	178.75	151.50
2.75 "	392.50	281.25	368.50	374.00
2.50 "	256.25	252.50	282.25	248.50
2.25 "	89.25	192.75	113.50	105.00
2.00 "	19.50	75.75	23.25	48.00
Screenings	32.75	48.75	14.50	50.50

Plate 1 shows typical samples of grain of Victorian f.a.q. retained by each of the various sieves, and Plate 2 represents in graphical form the constitution of the various f.a.q. samples. It will be seen that the curves for New South Wales, Victoria, and Western Australia agree very closely, New South Wales showing a slightly higher amount of the larger-sized grains than any of the other States. On the other hand, the curve representing the constitution of South Australian grain is *abnormal, owing to the large amount of small-sized and shrivelled grain* in the sample. This latter feature is undoubtedly the result of the abnormally dry season through which the State passed last year. A comparison of the results obtained in 1914 with those of the preceding year shows that the percentage of first-grade wheat has been reduced in all States. *This will be seen from Table III.*:—

TABLE III.

SHOWING PERCENTAGE OF FIRST-GRADE GRAIN (RETAINED BY 2.75 M.M. SIEVE) IN VARIOUS STANDARD SAMPLES.

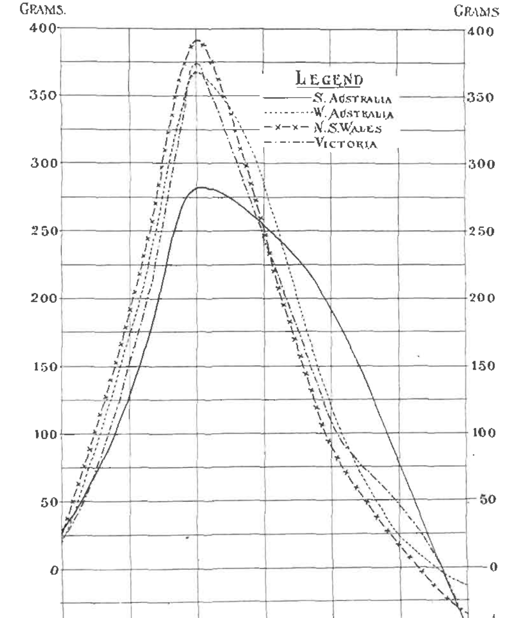
——	Season 1912–13.	Season 1913–14.
	Per cent.	Per cent.
New South Wales	62·2	60·1
Victoria	70·8	54·8
South Australia	59·5	43·0
Western Australia	..	56·6

The amount of screenings- cracked and pinched grain not retained by a 2.0 m.m. mesh—has increased from an average of 2.1 per cent. to an average of 4.4 per cent.

Taking the general quality of the wheat we have not only a lessened quantity of large grain in the wheat, but double the amount of screenings, as compared with the samples of the preceding season, was present.

On the basis of a combined export of 60,000,000 bushels from the four States, the amount of screenings exported—comprising almost [illegible] which

the freight to London is 30s. per ton. There can be no doubt that the elimination of these screenings and impurities from our exported wheat parcels, either as the result of more efficient preparation on the farm or by the use of grading machinery in a system of State bulk handling,



GRAPH SHOWING AMOUNT OF GRAIN IN F.A.Q. SAMPLES (1000 GRAMS) RETAINED BY SIEVES OF VARYING MESH.

Plate 2.

would further enhance the quality and value of Australian wheats on the world's markets, which enhancement must ultimately react in favour of the wheat-grower. Such screenings could well be used for the feeding of pigs and poultry.

Turning now to the composition of the grain, the following table gives the amount of moisture, nitrogen, and protein content, together with the bushel weight :—

TABLE IV.

MOISTURE AND PROTEIN CONTENT OF THE F.A.Q. SAMPLES.

——	Moisture.	Nitrogen.	Crude Protein.
	Per cent.	Per cent.	Per cent.
New South Wales ..	9·10	2·07	12·94
Victoria	10·23	1·79	11·19
South Australia ..	9·82	1·92	12·0
Western Australia ..	10·60	1·65	10·31

The four samples were then milled in the experimental flour mill, and *the percentage of bran, flour, and pollard determined.* These are given in Table V. :—

TABLE V.

MILLING TESTS OF F.A.Q. WHEATS, 1914.

State.	Bushel Weight.	Percentage Milling Products.			Colour.	Remarks.
		Flour.	Bran.	Pollard.		
	lbs.	per cent.	per cent.	per cent.	Max. 20 points.	
New South Wales	64	71·6	15·2	13·2	18	Grain excellent colour, plump, fairly hard. Bran choppy. Flour excellent bloom. Granular.
South Australia..	61½	70·8	17·4	11·8	18	Grain excellent colour and appearance. Bran broad, fairly thin. Flour excellent bloom. Soft.
Western Australia	61	69·7	19·6	10·7	17	Grain large, plump, dull colour and appearance. Bran broad, fairly thin. Flour excellent bloom. Granular.
Victoria ..	62½	69·9	18·7	11·4	18	Grain excellent colour and appearance. Bran broad, fairly thin. Flour excellent bloom. Granular.

The milling test declares in favour of the New South Wales sample, as it yielded considerably more flour of excellent colour and bloom. It proved to be very easy to mill, and the flour was of good strength.

The flour was then subjected to a series of tests to determine the moisture, protein, and gluten content, and strength. The results are summarized in Table VI.:—

TABLE VI.

SHOWING RESULTS OF TESTS ON FLOUR FROM STANDARD F.A.Q. WHEATS.

State	Moisture.	Nitrogen.	Protein Content.	Dry Gluten.	Strength.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
New South Wales ..	12.71	1.86	11.65	10.78	47.6
Victoria	12.78	1.48	9.25	8.51	45.6
South Australia ..	12.57	1.68	10.53	10.13	45.9
Western Australia ..	12.90	1.56	9.72	8.78	44.1

The moisture contents of the flours are practically similar, but considerable differences are observed in the amount of nitrogen and dry gluten present and the water absorption capacity of the flours. The New South Wales flour shows the highest gluten and protein content, followed by South Australia, Western Australia, and Victoria.

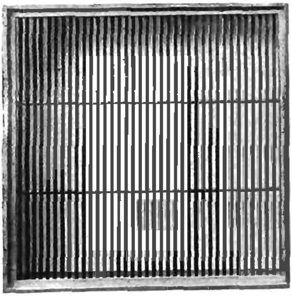


Plate 3.—Wheat Sieve.

The word "strength" as applied to flour is a somewhat elastic term, and various definitions have been put forward to express its meaning. Just what are the exact physical or chemical factors which together constitute "strength" are not known. It has long been supposed to be related to the character and amount of gluten, and the water absorption capacity of the flour.

So far as the nitrogen content is concerned, while it does not always follow that a wheat yielding a high protein content will give a well-piled loaf when baked, the more protein the flour contains the greater its nutritive and food value. Moreover, a flour that will absorb a relatively large quantity of water in order to give a dough of a consistency fit for baking, will generally make more loaves of bread per sack than one with lesser absorbing power.

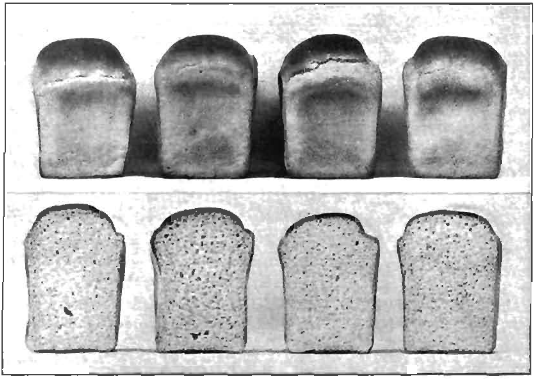
Basing our value for the time being on both these factors, it would appear that the New South Wales sample produces the best all-round flour, and is closely followed by the South Australian sample. Victorian flour absorbs more water than the Western Australian sample, but contains slightly less protein.

The respective flours were next submitted to a baking test, and the weight per standard loaf (340 grams of flour), volume, and the texture of the loaves were determined. The results are given in Table VII.:—

TABLE VII.

BAKING TEST F.A.Q. WHEATS, 1914.

State.	Weight afte. one hour.	Weight afte twenty-four hours.	olume.	Texture.	Colour.	Water used in making Dough.	Remarks.
	(Grams).	(Grams).	(c.c.)	Max. 20 Pts.	Max. 20 Pts.	(c.cs)	
New South Wales	482	473	1545	16	18	201	Excellent colour and appearance of loaf and crust; rose fairly well in oven.
South Australia	*475*	*465*	*1540*	*17*	*18*	*195*	*Excellent colour and appearance of loaf and crust;* rose well in oven.
Western Australia	470	460	1480	20	20	188	Excellent colour and appearance of loaf and crust; rose well in oven.
Victoria ..	481	472	1528	18	18	193	Excellent colour and appearance of loaf and crust; rose fairly well in oven.



Victoria. New South Wales. West Australia. South Australia.

Plate 4.

While the loaf from the West Australian sample was the smallest in volume, the finished loaf possessed an even texture and excellent colour. The Victorian sample was slightly inferior in both respects, *although the volume and weight of the loaf was higher. The loaves from* the New South Wales and South Australian samples were of a more open and coarse texture, with a honey-combed appearance (*vide* Plate 4). The New South Wales loaf was the largest and heaviest and absorbed more water in doughing, and though having the outward *appearance of being a good loaf, it revealed a somewhat coarse honey-*combed structure within.

Summary.

1. Standard samples (f.a.q.) of New South Wales, Victoria, South Australia, and Western Australia for the season 1913-14 were submitted for examination.

2. The total impurities found were considerably in excess of the previous season's standard for all samples.

3. The amount of such impurities exported last season was approximately 12,000 tons, the freight on which amounted to £18,000.

4. Stinking Smut (*Tilletia tritici*) was found in all f.a.q. samples.

5. The percentage of first-grade grain in the samples for the season 1913-14 was considerably less than that of the season 1912-13.

6. The most marked divergence was noticeable with the South Australian and Victorian samples, and is probably the result of a dry season.

7. The amount of screenings in the wheat exported is equivalent to 70,714 tons.

8. The composite sample of the wheat from the four wheat-exporting States contains 9.16 per cent. of moisture, 1.86 per cent. of nitrogen, and 11.61 per cent. of crude protein.

9. A composite sample of straight-grade flour of the four States contains 1.65 per cent. of gluten, a water absorption capacity of 45.8 quarts of water per 200-lb. sack of flour, and a bread-making capacity of 290 lbs. per sack.

BEE-KEEPING.

NOTICE TO OWNERS OF BEES.

The attention of owners of bees is invited to a Regulation under the *Bees Act* 1910, as follows:—

> "Prescribed hive" shall mean any hive, the combs of which are in frames and capable of easy removal for the purposes of inspection.

This Regulation was approved by the Governor in Council on the 29th April, 1913 (*vide* the *Victoria Government Gazette* of 7th May, 1913), and is now operative in the districts defined in a Proclamation under the Act, dated 25th May last.

The districts mentioned in the Proclamation are the Shires of Bright, Colac, Hampden, Kowree, Lexton, Mortlake, Warrnambool.

The effect of the Proclamation and the Regulation in conjunction is that bee-keepers in those localities may not keep bees in other than "prescribed hives."

We are, however, authorized to notify that, whilst the Proclamation has effect from the 1st instant, all owners are afforded opportunity to arrange for the transfer during the coming swarming season, and that the section of the Act, which prescribes a penalty not exceeding £20 for failure to comply with the provisions of the Act, will not be enforced until every owner has had time to conform thereto.

In order to effect the change with as little inconvenience as possible, owners are recommended to have frame hives in readiness to hold all swarms.

STANDARD TEST COWS.

Second Annual Report on the Testing of Pedigree Herds, conducted by the Department of Agriculture, Victoria, for Year ended 30th June, 1914.

By R. T. Archer, Senior Dairy Inspector.

[Note.—In submitting this report it is desired by the Director of Agriculture that the policy of the Department on the matter of the improvement of the breeding of dairy stock by means of herd testing should be stated.

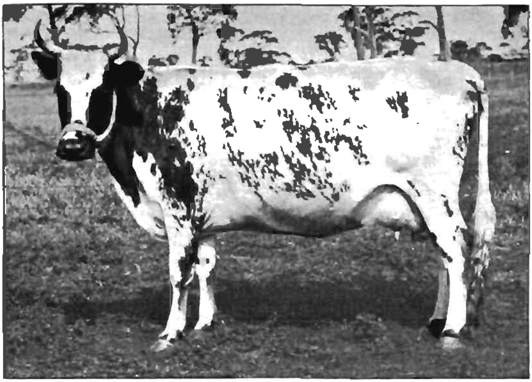
Such policy is a full parallel of that introduced some years ago in connexion with the breeding of horses, viz., the carrying out of a scheme whereby the breeders of dairy cattle may be guided in the selection of sires by the publication of the milk and butter fat records of dams. In the case of horses, the sound and suitable type stallions are given a Government certificate, and are so manifested to breeders as suitable sires to breed from. In the case of dairy breeds of cattle under the Government Standard Herd Test, the dams of bulls likely to throw good producers are certificated according to their standard of production. As in the case of certificated stallions, the names of all cows which reach the Government standard are published, and their pedigrees may be obtained on application to the Department.

So that now, for the first time, and through the agency of the Department, dairymen who wish to improve their stock have some definite guide in the choice of a bull by means of the certified information concerning the yielding capacity of the dam.

Obviously such a scheme must be confined to pedigree herds, for the experience of all breeders in all countries emphasizes the folly of using a nondescript or mongrel-bred sire, and consequently encouragement of the use of such cannot be given by the Government.

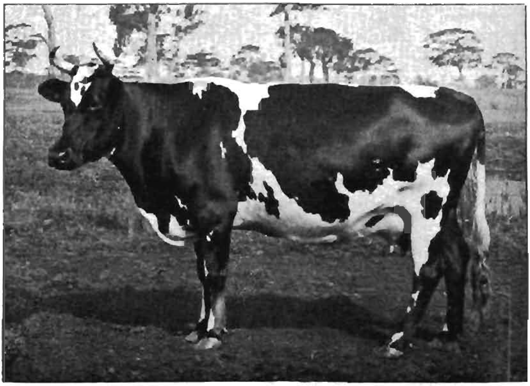
It is not within the power of a dairyman to ascertain the merit of the cows in a herd from which he proposes to select a bull, consequently he needs the assistance of some such scheme as the Government Standard Test, and it becomes a proper function of the Government to afford him such assistance. But it is within the power of every dairyman to ascertain for himself—either by himself carrying out the test or by forming a herd-testing association—the relative merit of the cows in his own herd. Furthermore, it is a profitable thing for him to do for himself, and there is, therefore, no good reason why it should be done for him by the Government. General herd testing is, however, just as important a factor in the improvement of the dairy herds as is the use of bulls with an assured milking pedigree. The two schemes should, therefore, go hand-in-hand. They are inter-dependent if the best results are to be obtained quickly. The use of standard-bred bulls will assuredly raise the milk yield, but their use in herds from which the culls have been removed as a result of general herd testing will effect the object aimed at in half the time.—Ed. *Journal of Agriculture.*]

The dairying industry is one of the most important in the State of Victoria, because it is comparatively a poor man's industry. That is, a man can start dairying on less capital than is required in any other of



Scottish Queen of Gowrie Park.

273 days—milk, 12,022 lbs.; average test, 4.87; butter fat, 585.13 lbs.; commercial butter, 667.05 lbs.; milk last day, 21 lbs. First in Test cows over 4 years. Owner, W. P. Brisbane.



Ida of Gowrie Park.

273 days—milk, 10,867¾ lbs.; average test, 5.1; butter fat, 554.89 lbs.; commercial butter, 632¼ lbs.; milk last day, 23 lbs. Second in Test cows over 4 years. Owner, W. P. Brisbane.

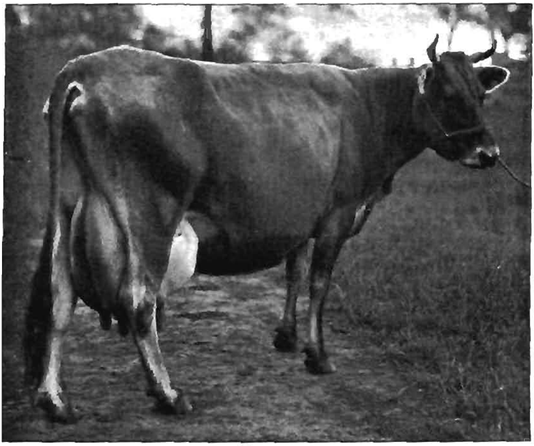
the leading rural industries: also he can make a living on a smaller area of land, provided he follows proper methods, which primarily includes

Laura IV. **Wallace.** **Bloomer (two years old).**

273 days—9,291 lbs. milk; 4.67 test; 434.13 lbs. *fat; 10½ lbs. last day.*

273 days—8,138 lbs. milk; 4.62 test; 375.66 lbs. *fat; 25½ lbs. last day.*

Owner, W. P. Brisbane.



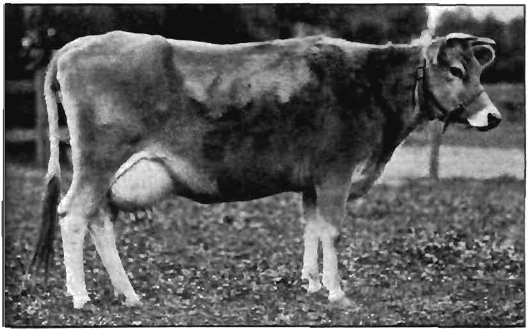
Noreen.

273 days—milk, 11,427 lbs.; *average test,* 4.58; *butter fat,* 523.6 lbs.; *commercial butter,* 597 lbs.; milk last day, 24½ lbs. Third in Test cows over 4 years. Owner, C. Gordon Lyon.

the use of suitable animals, properly bred, properly fed, and properly *treated. If the cattle are not properly bred, the best feeding possible*

will not produce satisfactory results. On the other hand, there are many cows in this State that are kept at a loss now which would return a substantial profit if properly fed and properly treated.

The recording of cows' milk yields and butter fat test, and thereafter, from the information so gained, culling the inferior, is one of several means of increasing the returns from the herd. Proper feeding is all-important, and it is safe to say that if all our cows were properly fed the average returns might be increased by 50 per cent. Full confirmation of this possibility has been afforded throughout the Government Herd Tests during the past two years. One instance may be given: Two Jersey cows, dam and daughter, were entered for the test, and were during the early period milking fairly well, but the owner was not feeding them in such a manner as to enable them to give their best results until the visiting Supervisor explained what proper feeding meant in the way of increased yields, and how it should be carried out. The result was

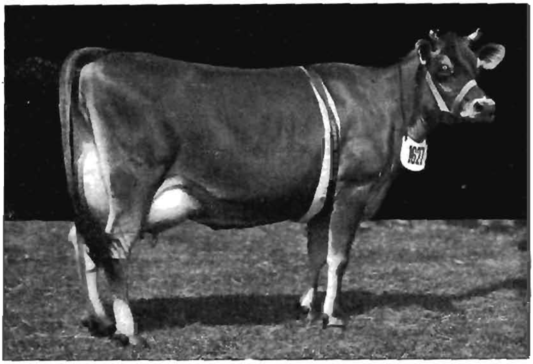


Luxury I.

273 days—milk, 8,791 lbs.; average test, 5.73; butter fat, 503.76 lbs.; milk last day, 19½ lbs. Fourth in Test cows over 4 years. Owners, E. N. and S. O. Wood.

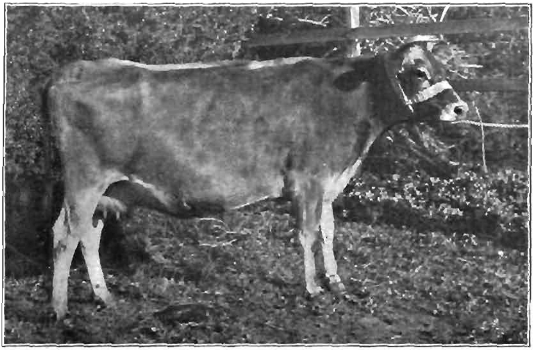
that more suitable food was provided, and these two cows at the end of their nine months' test were giving nearly as much milk and butter as at the commencement, finishing the season with 6,788 lbs. of milk and 239.8 lbs. of fat, and 6,352 lbs. of milk and 323.5 lbs. of fat, respectively. The owner of these two cows bought the former in calf for 9 guineas—the latter cow in the test was the calf. After the test results were known, he sold the two cows back to the former owner for 80 guineas, besides having several valuable heifers from them. When the Supervisor is going to take samples, he does not let the owner know, so there is no chance of their having special treatment. It has been said that the Standard Herd Test is beginning at the wrong end of the business, and that the general Herd Test should come first. The importance of the general Herd Test is fully realized, the object of which is to discover which cows are capable of giving profitable returns when properly fed and

treated, and in order that heifers from these may be reared to take the place of those culled. Now, unless these heifers are by a bull known to



Sweetbread XXIV. (imp.)

273 days—milk, 8,421 lbs., average test, 5.84; butter fat, 492.19 lbs.; commercial butter, 561 lbs.; milk last day of test, 24 lbs. Fifth in Test cows over 4 years. Owner, C. D. Lloyd.

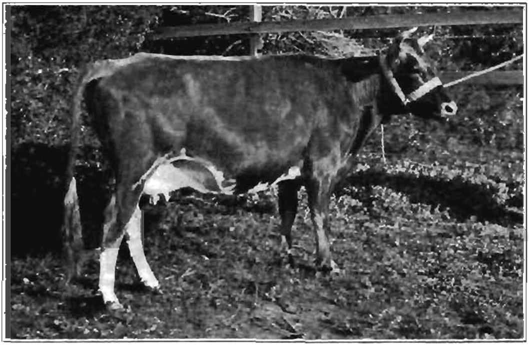


Fuschia VII. of Melrose.

273 days—milk, 8,847 lbs.; average test, 5.13; butter fat, 454.17 lbs.; milk last day of test, 21½ lbs. Sixth in Test cows over 4 years. Owner, W. Woodmason.

be bred from a heavy butter-producing family, there is no certainty that they will be any better than those already in the herd. In the past

there has been so much disappointment in the results of using expensive pedigreed sires, that it was generally admitted that the time had arrived when dairy farmers should be in a position to obtain reliable information



Empire IV. of Melrose.

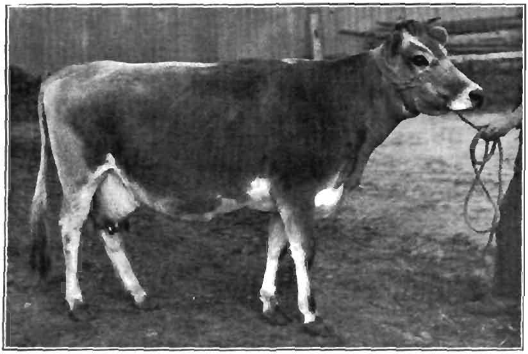
273 days—milk, 7,787 lbs.; test, 5.64; butter fat, 439.63 lbs.; milk last day of test, 18½ lbs. (dry). Seventh in Test cows over 4 years. Owner, W. Woodmason.

Wilful Venture.

273 days—milk, 6,872 lbs.; test, 6.27; butter fat, 431.19; milk last day of test, 19 lbs. (dry). Ninth in Test cows over 4 years. Owner, P. E. Keam.

as to where bulls of the different breeds, that might be depended upon to work improvement in the herd, could be purchased at a reasonable figure, and the Government Herd Test is designed to afford that information, by

means of the publicity given to the records of the individual cows comprising the pedigree herds of the State. The scheme is costly comparatively, but this is due to the necessary close supervision in conducting the tests to insure that the results are reliable. The information already obtained is a valuable advertisement for the pedigree herds of this State, and statistics and data of great worth will be obtainable from the records in the future. The best cow in this year's test is Scottish Queen, by the imported bull Lessnessock. She gave 12,022 lbs. of milk, with an average test throughout of 4.87 per cent., equal to 585 lbs. of butter fat, valued at 1s. per lb., the gross income for fat, £29 5s. In addition, 10,820 lbs. skim milk has a nutritive value capable of producing 360 lbs. of pork, at a value of 6d. per lb., this is equal to £9, and, leaving out manure of the value of £3 10s., makes a total money return of £38 5s. Allowing £7 10s. for the keep of the cow, the cost of production per lb. of the butter fat (at £7 10s. for 585 lbs.) is 3d., which leaves a surplus of 9d. per lb.

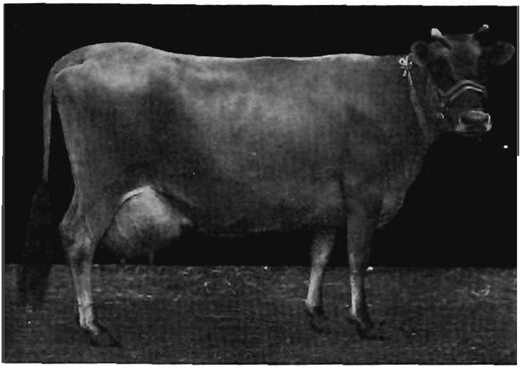


Jessie V. of Melrose.

273 days—milk, 7,487 lbs.; test, 5.6; butter fat, 419.33 lbs.; milk last day of test, 24 lbs. Twelfth in Test cows over 4 years. Owner, W. Woodmason.

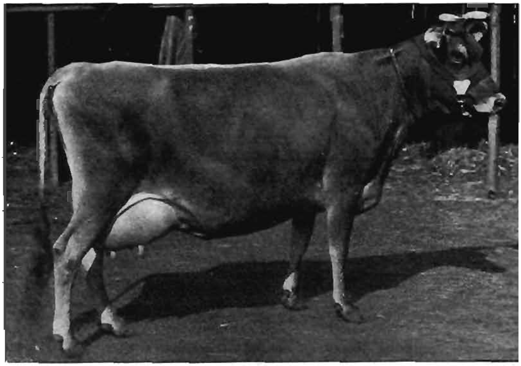
Mr. Brisbane sells his bull calves on the basis of 1s. for each lb. of butter the dam gave in the previous season under Government test; allowing Scottish Queen's calf to be worth, say 30 guineas, this cow's grand total earnings for the year would be approximately £70. Deduct from this cost of keep, &c., on a liberal scale, say, £10, and the result is equal to 10 per cent. on £600. What would be the effect of a bull from such a cow in a herd of 50 cows giving the average return of 136 lbs. of fat? Assuming that half the calves are heifers, it would be safe to say the fat returns from these would be at least doubled, making 272 lbs. Two years would produce enough heifers to replace all the original herd, with an increase of £6 16s. per cow, or an annual increase of £340, to say nothing of increase in skim milk, value of calves, &c.

In the perusal of the second annual list of standard cows presented herewith it will be seen that steady progress is being made both with



Handsome Girl III.

273 days—milk, 7,542¾ lbs.; test, 5.55; butter fat, 418.95 lbs.; commercial butt 477.6 lbs.; milk last day of test, 17½ lbs. Thirteenth in Test cows ove years. Owner, W. Woodmason.

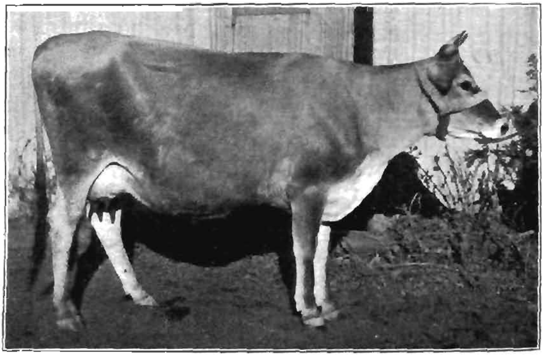


Silvermine IV.

Winner of first year's test. 1912 record—273 days—milk, 6,944 lbs.; test, 5. butter fat, 359.9 lbs.; commercial butter, 410¼ lbs.; milk last day of t 17½ lbs. 1913 record—273 days—milk, 7,591¾ lbs.; test, 5.12; butter 388.8 lbs.; commercial butter, 443¼ lbs.; milk last day of test, 20½ Twenty-fourth in Test cows over 4 years. Owner, C. Gordon Lyon.

Kathleen III.

273 days—milk, 7,586¼ lbs.; test, 5.39; butter fat, 409.18 lbs.; commercial butter 466¼ lbs.; milk last day of test, 21½ lbs. First in Test cows under 4 years. Owner, C. Gordon Lyon.



Foxglove of Springhurst.

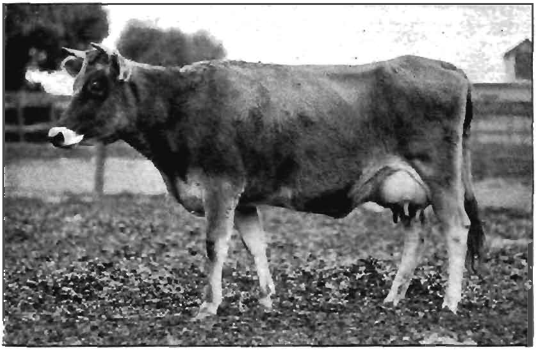
(Two years old.)

273 days—milk, 6,073¾ lbs.; test, 5.44; butter fat, 329.73 lbs.; milk last day of test, 14½ lbs. Second in Test heifers, 175 lbs. standard. Owner, J. D. Read.

regard to the number of herds in the test and the amount of milk and butter fat from the best cows.

For the year ending 30th June, 1913, the best return for nine months' milk was Mr. C. Gordon-Lyon's Silvermine IV., which gave 7,591¾ lbs. of milk, average test 5.12, butter fat 388.8, plus 14 per cent.=443½ commercial butter, and 20½ lbs. milk on the 273rd day of test. An interesting feature of this cow's test is that for both years the average was 5.1 fat.

For year ending 30th June, 1914, the best result was from Mr. W. P. Brisbane's *Scottish Queen, with 12,022 lbs. milk, 4.87 per cent. test,* 585.13 lbs. butter fat, plus 14 per cent.=667 lbs. commercial butter, and 21 lbs. milk on the 273rd day. Ida of Gowrie Park was second with 10,867¾ lbs. milk, 5.1 per cent. test, 554.89 lbs. fat, plus 14 per cent.= 632½ lbs. commercial butter, and 23 lbs. milk on the last day of test. The



Luxury II. (2 years old).

273 days—milk, 6,177 lbs.; test, 5.26; butter fat, 325¼ lbs.; milk last day of test, 15½ lbs. Third in Test heifers, 175 lbs. standard. Owner, E. N. Wood.

third cow, and at the same time the best of the Jerseys, is Mr. Lyon's Noreen, who is fourteen years old, and gave 11,427 lbs. milk, 4.58 per cent. test, 523.6 lbs. fat, plus 14 per cent.=597 lbs. commercial butter, and 24½ lbs. milk on the last day—a truly fine record.

An interesting fact with regard to Noreen was that when she went out last season she had a bad attack of mammitis, but came in this season with a very fine show, and every quarter sound.

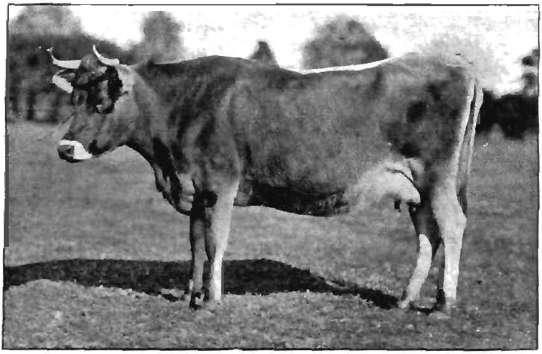
Mr. Ernest Wood's Jersey cow Luxury, bred by Mr. W. Woodmason, is fourth with 8,791¾ lbs. milk, 5.73 per cent. test, 503.76 lbs. fat, plus 14 per cent.=574 lbs. commercial butter, and 19½ lbs. milk on the last day of test.

Fifth comes that beautiful cow, imported from Jersey by Mr. C. D. Lloyd, which was champion of the last Melbourne Royal, viz., Sweetbread XXIV. Her performance at the pail, added to her magnificent type and

quality, makes her an exceptionally valuable animal and a welcome addition to the pedigree blood of the Commonwealth. She gave 8,421 lbs. milk, 5.84 per cent. test, 492.19 fat, plus 14 per cent.=561 lbs. commercial butter, and 24 lbs. milk on the last day.

Sixth is Mr. W. Woodmason's Fuchsia VII. of Melrose with 8,847 lbs. milk, 5.13 per cent. test, 454.7 lbs. fat, plus 14 per cent.=517¾ lbs. *commercial butter, and 21¾ lbs. milk on the last day; and the seventh* cow is the property of, and bred by, the same owner, Empire IV. of Melrose, with 7,787¾ lbs. milk, 5.64 per cent. test, 439.63 lbs. fat, 501¼ lbs. commercial butter, and 18½ lbs. milk on last day of test.

Mr. Brisbane's Honey gave the greatest weight of milk in one day, with 67 lbs. She did not keep it up quite as well as some of the others, but was then fourth for weight of milk, with 10,798¼ lbs. Her test was not up to the average of her herd mates, being only 3.92 per cent.=



May B. (2 years old).

273 days—milk, 4,863 lbs.; test, 6.19; butter fat, 301 lbs.; milk last day of test, 14½ lbs. (dry). Seventh in Test heifers, 175 lbs. standard. Owners, G. D and H. S. Wood.

423.15 lbs. fat, and 482½ lbs. commercial butter, and 8¼ lbs. on last day of test; but still a fine record.

The first heifer this year is Mr. Brisbane's Bloomer, out of Brown Pet, and the first heifer to milk by his present stud bull Wallace, out of Laura IV. Bloomer gave 8,138 lbs. milk, 4.62 per cent. test, 375.66 lbs. fat=428½ lbs. commercial butter, and 25½ lbs. milk on last day of test, so she was still *going strong*. At 1s. per lb. for fat, her money return is £18 15s. 7d. In addition, there would be 732 gallons of skim milk that would be equal to 244 lbs. pork at 6d.—£6 2s. The value of her manure would be about £3 10s., making a total of £28 7s. 7d. Allowing £7 10s. for cost of production, leaves a net return of £20 17s. 7d. 375½ lbs. of fat costing £7 10s. works out at 4¾d. per lb.

Mr. J. D. Read's heifer Foxglove is second with 6,073¾ lbs. milk, average test 5.44 per cent.=329.73 lbs. fat, plus 14 per cent.=375.89 lbs.

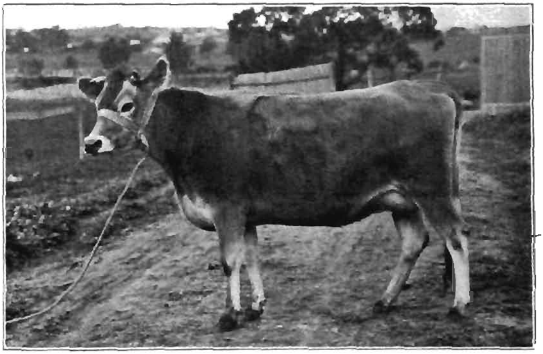
commercial butter, with 14½ lbs. of milk on the last day of test. This was also the best return for Jersey heifer.

Mr. W. Woodmason's heifer—Mystery XIII. of Melrose—is worthy of notice on account of the very high average test. She gave 4,121 lbs. milk, average test 7.94=292.38 lbs. fat, plus 14 per cent.=333.31 lbs. commercial butter, and 11½ lbs. milk on the last day.

It will be noted that the commercial butter is estimated on a 14 per cent. over-run. When comparing with other places where the fat on test is not stated, it must be borne in mind that their over-run is worked out on a different basis, which gives from 2 to 4 per cent. higher results.

The herd average (for ten cows or over) given below will be found interesting. Mr. Woodmason heads the list for the twenty-two cows which completed the test during the year.

Owner.	No. of Cows	Milk. lbs.	Average Test.	Average Fat.	£	s.	d.
Woodmason, W. ..	22 (Jersey) ..	6,465	5.57	353 at 1s. ..	17	13	0
Brisbane, W. P. ..	35 (Ayrshire) ..	7,298	4.37	327 ,, ..	16	7	0
Gordon-Lyon, C. ..	12 (Jersey) ..	6,572	4.97	325 ,, ..	16	5	0
Read, J. D. ..	18 (Jersey) ..	5,160	5.44	280 ,, ..	14	0	0
Dept. of Agriculture	30 (Red Poll) ..	5,240	4.45	262 ,, ..	13	2	0
Manifold, W. ..	32 (M. Shorthorn)	5,653	3.9	221 ,, ..	11	1	0
Stansmore, F. J. ..	45 (Ayrshire) ..	5,155	3.97	213 ,, ..	10	4	0



Mystery XIII. of Melrose (2 years old).

273 days—*milk*, 4,121 *lbs.*; *test*, 7.94; *butter fat*, 292.38 *lbs.*; *milk last day of test*, 24 lbs. (dry). Eleventh in Test heifers, 175 lbs. standard. Owner, W. Woodmason.

The cows belonging to the Geelong Harbor Trust were milking several months prior to being entered in the test, so their figures cannot be compared.

It will be seen that many of the leading breeders have not entered the test. The excuse of some is that cows will do so much better on natural feed than when hand fed, that the results of their herds would suffer in comparison with those in richer country. While it is admitted that a mixture of grasses and clovers grown in such country is the ideal food for cows in milk, the herd that has given the best average returns under the test is Mr. Woodmason's, which is almost entirely hand fed, the pasture available for them being very poor. The same may be said of Mr. Gordon-Lyon's, although his pasture is a little better. Should all the feed have to be purchased, they can be properly fed for 1s. per day, *i.e.*, £13 13s. for nine months, during which time Mr. Woodmason's cows averaged £17 13s. on a butter fat basis, to say nothing of skim milk and manure, which is more valuable on account of better feed.

If the feed is grown on the farm it should not cost half the above amount to feed the cows properly, so that the question should not stand in the way of breeders entering their herds.

In connexion with the Standard Herd Test, the Government has decided to award prizes through the Royal Agricultural Society of Victoria at the show in 1915 and after. The terms of the competition are as follows:—

(1) *Grand Champion Cow*—under Herd Test regulations.

A grand champion prize of £100 as a trophy or cash for maintaining the position of annual champion for three successive years.

(2) *Annual Champion Cow*—under Herd Test regulations.

A prize of £25, to be awarded to the cow which, on completion of lactation period, gives the greatest amount of butter fat under the herd testing regulations of this Department during a lactation period terminating within a year ending 30th June. If two lactation periods are completed within the year, the last will be the period considered.

(3) *Annual Reserve Champion*—under Herd Test regulations.

A prize of £15 per annum to be awarded to the cow attaining second place under the herd testing regulations of the Department during year ended 30th June.

These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such show, the owner to exhibit his next best cow.

(4) *Best Herd*—under Herd Testing regulations.

A prize of £50, to be awarded to the herd giving the greatest average return under the herd testing regulations of this Department under the following conditions:—

(1) Minimum number of cows (completing the test during the year) in a herd—10.

(2) Such herd to average 300 lbs. of butter fat.

(*a*) Handicaps to be allowed under the following scale:—

I. A herd of more than 10 cows will receive a handicap of ½ lb. of butter fat for each cow.

II. Cows entered under Regulation 11 (*a*) will receive a handicap of 75 lbs. of butter fat.

III. Cows entered under Regulation 11 (*b*) and (*c*) to receive a handicap of 50 lbs. of butter fat.

The prize to be allotted for the year ending 30th June, and the three best cows in the winning herd to be exhibited at the next Royal Agricultural Society's Show.

No cow competing for any prize shall be milked more than twice a day, and must calve again within 15 months.

STANDARD TEST COWS.

Government Standard Second year.

Cows over 4 years of age ..	..	250 lbs. butter fat
Cows under 4 years of age ..	..	200 .. .. ..
Heifers	..	175 .. .. ..

Cows.

Ayrshires	81
Jerseys	71
Red Polls	30
Milking Shorthorns	32
Dexter Kerry	2
Total competing	216

RETURN OF CERTIFICATED COWS FOR YEAR ENDING 30th JUNE, 1914.

MRS. B. M. BECKWITH, *Malvern.* (DEXTER KERRY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Colleen	Not yet allotted	21.6.13	28.6.13	273	10¼	4,363	4·67	203¾	175	232¼
Fit Willow	.	3.7.13	13.7.13*	271	4¾	3,454	5.61	194	175	221

* Entry deferred three days as weights not recorded earlier.

F. CURNICK, *Malvern.* (JERSEY.)

Completed during the year—3. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Peerless of Melrose III.	2817	9.10.12	20.10.12*	273	13¾	6,352½	5·09	323½	250	368
Waverley Lass ..	2793	4.10.12	20.10.12*	273	14½	6,788¼	4·86	329¾	250	376
Eva	Not yet allotted	7.9.13	14.9.13	273	20½	6,015¼	5·00	301	175	343

* Entry deferred, as yields were not recorded earlier.

W. P. BRISBANE, Weerite. (AYRSHIRE.)

Completed during the year—34. Certificated—32.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of
					lbs.	lbs.		lbs.	lbs.	lbs
Chaffinch of Gowrie Park	2413	17.3.13	24.3.13	273	16¾	7,518½	4·75	357½	250	40
Heather Duchess of Gowrie Park ..	1449	17.3.13	24.3.13	273	16¾	7,112¼	4·77	339½	250	38
Lady Brassey of Gowrie Park	2424	18.3.13	25.3.13	273	7¾	5,839½	4·75	277¼	250	31
Blossom of Gowrie Park	2411	19.3.13	26.3.13	273	12¼	8,693¾	4·94	429¾	250	48
Ida of Gowrie Park ..	2423	27.3.13	3.4.13	273	23	10,867¾	5·10	555	250	63
Dolly Varden of Gowrie Park	2418	1.4.13	8.4.13	273	5½	6,232½	4·46	366¾	250	41
Qually of Gowrie Park	2431	3.4.13	10.4.13	273	10½	7,008	3·94	276	250	31
Little Favourite of Gowrie Park	701	5.4.13	12.4.13	273	2	7,590	3·77	286½	250	32
*Brown Queen of Gowrie Park	2412	8.4.13	15.4.13	273	10	7,954	4·04	321¾	250	3[illegible]
Ruby Lass of Gowrie Park	2433	14.4.13	21.4.13	273	7½	7,355½	4·26	313¼	250	35
Patch of Gowrie Park ..	2430	26.4.13	3.5.13	256	½	7,032¼	4·64	326¼	250	37
Honey of Gowrie Park ..	2422	12.5.13	19.5.13	273	8¼	10,798¼	3·92	423¼	250	48
Aimie of Gowrie Park ..	2408	5.5.13	12.5.13	266	¾	6,405½	4·99	320	250	36
Gladys of Gowrie Park	2421	9.5.13	16.5.13	273	1¼	6,340½	4·39	278½	175	31
Trixie of Gowrie Park	2434	10.5.13	17.5.13	273	4	8,151½	4·29	350	250	39
Fairy of Gowrie Park ..	1707	5.6.13	12.6.13	273	4½	5,912¾	4·45	263¼	250	30
Ethel of Gowrie Park ..	2419	12.7.13	19.7.13	273	5½	5,929¼	4.68	277¾	250	31
Princess of Gowrie Park	1710	13.7.13	20.7.13	273	5¼	7,472¾	4·63	346½	250	39
Diamond of Gowrie Park	Not yet allotted	13.7.13	20.7.13	244	4¼	4,738½	4·70	222¾	175	25
Sunlight of Gowrie Park	..	19.7.13	26.7.13	273	7½	5,535	4·66	258	175	29
Moonlight of Gowrie Park	..	19.7.13	26.7.13	273	12	6,896	4·51	311	175	35
Scottish Queen of Gowrie Park	2121	21.7.13	28.7.13	273	21	12,022	4·87	585¼	250	6[illegible]
Dairymaid II. of Gowrie Park	2415	29.7.13	5.8.13	273	11	7,237¾	4·44	321¼	250	36
Dainty Polly of Gowrie Park	2414	6.8.13	13.8.13	207	4¾	6,426	4.05	260½	250	29
Nettle of Gowrie Park	2429	11.8.13	18.8.13	273	7	6,073	4·20	255	250	29
Royal of Gowrie Park ..	Not yet allotted	21.8.13	28.8.13	273	12	6,063½	4·22	256	200	29
Bonny Bess of Gowrie Park	2092	7.9.13	14.9.13	273	24	9,716¾	4·49	436¾	250	4[illegible]
Fairy of Willow Vale ..	1354	7.9.13	14.9.13	273	16	6,760¾	3·87	261½	250	2[illegible]
Linda of Gowrie Park ..	2426	9.9.13	16.9.13	273	13½	9,352	4·48	418¾	250	47
Empress of Gowrie Park	Not yet allotted	17.9.13	24.9.13	273	11½	4,399½	4·82	212¼	175	24
Bloomer of Gowrie Park	2410	20.9.13	27.9.13	273	25½	8,138	4·62	375¾	175	4[illegible]
Actress of Gowrie Park	2407	22.9.13	29.9.13	273	11½	5,300½	4·63	245½	200	27

* Sore foot caused protracted lameness, affecting yield.

GEELONG HARBOR TRUST, Marshalltown. (AYRSHIRE.)

Completed during the year—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	*Estimated Weight of*
					lbs.	lbs.		lbs.	lbs.	lb
Frolic of Glen Elgin ..	1817	30.5.13	6.6.13	273	3¼	5,656½	4·46	252¼	250	2[illegible]

DEPARTMENT OF AGRICULTURE, Werribee. (RED POLL.)

Completed during the year—30. Certificated—22.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Birdseye	Not yet allotted	3.10.12	10.10.12	273	8	4,351½	5·75	250½	175	285¼
Cubal	"	7.10.12	14.10.12	244	2	6,288¾	4·28	269	250	306¾
Kentucky .. .	"	18.10.12	25.10.12	266	5	6,249¼	4·09	256	250	291¾
Egypta	"	28.10.12	4.11.12	273	19	6,304¼	4·27	269¼	250	307
Goldleaf . ..	"	5.11.12	12.11.12	273	14	6,437¼	4·79	308½	175	351½
Atlanta . ..	"	29.5.13	5.6.13	273	16½	5,200¾	4·88	253½	200	289½
Sumatra .. .	"	19.6.13	26.6.13	273	16½	7,005	4·18	293	250	334
Turka	"	29.6.13	6.7.13	273	8½	5,431¾	4·66	254	200	288¼
Bullion .. .	"	28.7.13	4.8.13	273	15	8,026¾	4·28	343¾	250	391¾
Connecticut	"	28.7.13	4.8.13	273	6½	7,155½	4·38	313½	250	357½
Mexicana	"	4.8.13	11.8.13	273	11	6,647¼	4·55	302¼	200	344¾
Virginia . ..	"	9.8.13	16.8.13	273	14	7,958½	4·29	341¼	250	389
Muria	"	9.8.13	16.8.13	273	14½	7,287¼	5·00	364¾	250	415¾
Vuelta . ..	"	13.8.13	20.8.13	273	6½	7,668	4·13	316¾	250	361
Persica	"	22.8.13	29.8.13	273	19½	6,686¼	4·53	302¾	200	345
India	"	22.8.13	29.8.13	245*	11	6,150	4·37	268½	200	306¼
Europa . ..	"	23.8.13	30.8.13	273	15½	6,043	4·56	275¾	250	314¼
Netherlana . ..	"	27.8.13	3.9.13	273	13½	4,439¾	4·20	186½	175	212½
Bridseye	"	30.8.13	6.9.13	273	19	6,232¼	5·47	341	200	388¾
Cigarette	"	4.9.13	11.9.13	273	23	8,167¾	4·08	333½	250	380¼
Cuba .. .	"	7.9.13	14.9.13	273	7½	6,582¼	4·46	293¾	250	335
Havana .. .	"	20.9.13	27.9.13	241†	4½	6,364½	4·15	264¼	250	301

* Aborted 30th April, 1914.
† Went dry through lameness from sore foot.

A. W. JONES, Whittington. (JERSEY.)

Completed during the year—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Grey V. ..	Not yet allotted	23.7.13	30.7.13	259*	12	5,437¾	5·62	305¾	175	348¾

* Lost first fourteen days through omission to weigh. An attack of mammitis also affected yield.

P. E. KEAM, Heidelberg. (JERSEY.)

Completed during the year—3. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
White Star	2795	6.12.12	13.12.12	273	5	4,174¾	6·13	256¼	200	292¼
Dewfall	968	26.12.12	2.1.13	270*	26¾	7,647¾	4·67	357	250	407
Wilful Venture ..	2974	13.8.13	20.8.13	273	19	6,872	6·27	431¼	250	491¼

* Sold three days before completion of term.

C. D. LLOYD, Caulfield. (JERSEY.)

Completed during the year—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
weetbread XXIV. (Imp.)	Not yet allotted	*3.8.13*	*10.8.13*	*273*	24	*8,421*	*5·84*	*492¼*	*250*	561
ucina	,,	19.9.13	26.9.13	273	6	3,387½	6·76	229	200	261¼

C. GORDON LYON, Heidelberg. (JERSEY.)

Completed during the year—11. Certificated—11.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
lver Audrey ..	1378	11.12.12	18.12.12	273	14½	4,962¼	5·3	261¼	175	298
lver Pride	1387	17.12.12	24.12.12	273	15¾	4,950	4·7	232½	175	265
lvermine III. ..	715	12.1.13	12.2.13*	273	19	5,554¾	4·98	276¾	250	315½
Silver Spinney ..	*1388*	*7.2.13*	*14.2.13*	*273*	*6½*	*3,955¾*	*5·54*	*219¼*	*200*	*249¾*
Hawthorn of Banyule	1064	11.3.13	18.3.13	273	19½	7,160¼	4·91	356	250	405¾
athleen III. ..	*2140*	*27.7.13*	*3.8.13*	*273*	*21½*	*7,586¼*	*5·39*	*409¼*	*200*	*466½*
olly II.	614	12.8.13	19.8.13	273	17	7,429¼	4·97	369½	250	421¼
oreen	636	12.8.13	19.8.13	273	24½	11,427	4·58	523½	250	597
ivermine IV. ..	716	18.8.13	25.8.13	273	17½	6,944	5·18	360	250	410¼
udrey Lassie ..	825	5.9.13	12.9.13	273	17	7,596½	4·74	360	200	410½
ssie	509	22.9.13	30.9.13§	273	14	5,820¼	4·91	286	250	326

* Entry deferred one month on account of mammitis after calving.
† Mammitis affected yield.
‡ A protracted illness affected yield.
§ *Entry deferred one day on account of milk fever.*

W. T. MANIFOLD, Camperdown. (SHORTHORN.)

Completed during the year—32. Certificated—11.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
acelet II.	Not yet allotted	15.7.13	22.7.13	263*	11¾	5,121	4·05	207½	200	236½
rlin	,,	30.7.13	6.8.13	273	5¼	8,126	3·46	280¾	175	320¼
irymaid	,,	*4.8.13*	*11.8.13*	*206*	*4*	*7,104¾*	*3·53*	*250¾*	*250*	*285¾*
ra I.	,,	6.8.13	13.8.13	246	4¾	7,277	4·13	300¾	250	342¾
ttie	,,	*6.8.13*	*13.8.13*	*255†*	*4½*	*6,979*	*4·04*	*281¾*	*250*	*321*
r II.	,,	11.8.13	18.8.13	‡265½	11½	7,185½	3·78	271½	250	309½
l	,,	12.8.13	19.8.13	273	15	6,578¼	4·01	263½	250	300½
nel	,,	13.8.13	20.8.13	§218½	4½	5,408	3·74	202¼	175	230½
kscrew VIII. ..	,,	14.8.13	21.8.13	§268½	14¼	7,000¼	4·23	296½	200	337¾
gie	,,	14.8.13	21.8.13	166	5	6,928¾	4·64	321¾	250	366¾
kscrew V. ..	,,	15.9.13	22.9.13	188	4½	6,757	3·91	264¼	250	301¼

* Lost first ten days through omission to weigh.
† Lost first eighteen days through omission to weigh.
‡ Lost first seven and *half days through omission to weigh.*
§ Lost first four and half days through omission to weigh.

W. McGARVIE, Pomborneit. (JERSEY.)

Completed during the year—3. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs	lbs.		lbs.	lbs.	lbs.
Mousie	2388	19.7.13	26.7.13	239	4	8,425	3·86	325	250	370¼
Marjorie	2294	12.8.13	19.8.13	273	11¼	5,857	5·00	293	250	334
Ella	1894	19.9.13	26.9.13	273	15¾	4,422	4·74	209¾	200	239

J. D. READ, Springhurst. (JERSEY.)

Completed during the year—17. Certificated—17.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Springhurst	2521	8.3.13	15.3.13	273	18½	6,228¾	6·14	382¼	250	435¾
Graceful Magnet of Springhurst ..	2058	3.7.13	10.7.13	245	2½	5,496¼	4·62	254½	250	289¾
Euroa of Springhurst ..	1918	3.7.13	10.7.13	273	5	5,461¾	5·35	292½	250	333½
Cowslip of Springhurst	Not yet allotted	3.7.13	10.7.13	273	15½	5,252	4·94	259½	200	296
Stockings of Springhurst	2663	21.7.13	28.7.13	246	1	5,102¾	5·36	273¾	250	312
Beauty of Springhurst	1567	24.7.13	31.7.13	273	6½	4,462½	5·04	251½	250	286¾
Tulip of Springhurst ..	2730	26.7.13	2.8.13	255	5½	4,774¾	5·98	285¾	200	325¾
Pansy of Springhurst ..	2441	28.7.13	4.8.13	273	14	5,950½	5·04	299¾	200	341¾
Alsyke of Springhurst ..	1515	5.8.13	12.8.13	273	9½	5,762¼	5·82	335½	250	382½
Iris of Springhurst ..	Not yet allotted	13.8.13	20.8.13	273	15½	4,785½	5·26	251¾	175	287
Daphne of Springhurst	1803	22.8.13	29.8.13	273	5½	4,949¼	5.77	285¾	200	325¾
Dulcie of Springhurst ..	1878	29.8.13	5.9.13	273	17	5,981¾	5·68	339¾	250	387½
Nightshade of Springhurst	Not yet allotted	30.8.13	6.9.13	273	21½	5,963¾	4·97	296½	175	338¼
Foxglove of Springhurst	"	30.8.13	6.9.13	273	14½	6,073¾	5·44	329¾	175	376
Buttercup of Springhurst	"	2.9.13	9.9.13	273	14	5,043¼	5·59	282	175	321½
Canna of Springhurst ..	1673	14.9.13	21.9.13	253	4	4,182	5·34	223½	200	254¾
Daisy of Springhurst ..	1788	24.9.13	1.10.13	273	12½	4,312½	5·88	253½	200	289

F. J. STANSMORE, Pomborneit. (AYRSHIRE.)

Completed during the year—46. Certificated—16.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gaiety of Rythdale ..	Not yet allotted	29.11.12	6.12.12	273	18	4,988¾	4·30	215	175	245
Kathleen of Gleneira ..	1732	18.12.12	25.12.12	273	11	6,003½	3·75	225¼*	250	256¾
Clarice of Caulfield ..	Not yet allotted	6.2.13	13.2.13	273	5¼	6,816¾	4·43	301¾	250	344

* Qualified before standard was raised.

[*Continued next page*].

F. J. Stansmore, Pomborneit (Ayrshire)—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Flinders II. ..	Not yet allotted	7.2.13	14.2.13	273	8¼	5,522¼	3·98	219¾	200	250½
Tabitha of Gleneira ..	"	14.2.13	21.2.13	273	17¾	7,237¼	4·38	317	250	361¼
Milkmaid of Rythdale	"	14.2.13	21.2.13	273	7½	5,620	4·34	244	200	278
Docility of Yalart ..	"	16.2.13	23.2.13	268	8½	7,652¼	3·77	288¾	250	329¼
Ruby of Inverkiel ..	..	21.4.13	28.4.13	225	7	6,260¼	4·16	260½	250	297
Bella of Yalart ..	Not yet allotted	6.5.13	13.5.13	243	5	6,931	3·84	266½	200	303¾
Pansy of Yalart ..	..	10.5.13	17.5.13	269	4	6,793	4·18	284¼	250	324¼
Pewit of Rythdale ..	Not yet allotted	25.5.13	1.6.13	227	7	4,404	4·43	185	175	211
Nice of Caulfield ..	2722	8.6.13	15.6.13	196	3	5,076¾	5·30	269	250	306¾
Nancy of Yalart ..	..	14.6.13	21.6.13	233	4	6,102	3·99	243¾	200	277¾
Ada of Caulfield ..	Not yet allotted	19.6.13	26.6.13	229	5	6,957½	3·61	251½	250	286½
Lulu of Yalart ..	..	29.6.13	6.7.13	194	6	4,073¼	4·49	182¾	175	208¼
Rose of Yalart ..	1659	22.9.13	29.9.13	220	10½	6,662¼	3·85	256¾	250	292¾

E. N. and S. O. WOOD, Caulfield. (JERSEY.)

Completed since last report—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Luxury II.	Not yet allotted	27.7.13	3.8.13	273	15½	6,177¼	5·26	325¼	175	370¾
Luxury	"	20.8.13	27.8.13	273	19¼	8,791¼	5·73	503¾	250	574¼

G. D. and H. S. WOOD, Caulfield. (JERSEY.)

Completed since last report—1. Certificated—1.

Name of Cow.	*Herd Book No.*	*Date of Calving.*	*Date of Entry to Test.*	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	*Standard of Fat Required.*	*Estimated Weight of Butter.*
					lbs.	*lbs.*		*lbs.*	*lbs.*	*lbs.*
May B.	Not yet allotted	3.8.13	10.8.13	273	14¼	4,863	6·19	301¼	175	343¼

W. WOODMASON, Malvern. (JERSEY.)

Completed during the year—28. Certificated—28.

Name of Cow	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of *Milk Last* Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Flower of Melrose V. ..	Not yet allotted	19.10.12	26.10.12	186*	17½	4,302¾	5·8	250¾	250	285¾
Jessie of Melrose XI. ..	,,	*12.11.12*	*19.11.12*	*210†*	*15¼*	3,624¼	*6·5*	235¼	*175*	268¾
Jessie of Melrose IX. ..	,,	26.12.12	2.1.13	223‡	17¼	4,233¾	5·67	240½	200	274
Laura of Melrose VI. ..	,,	22.1.13	29.1.13	250§	26	6,623½	5·86	388½	250	443
Jenny Lind of Melrose VI.	,,	23.2.13	2.3.13	273	19¾	6,752	5·3	358¼	250	408¼
Daphne of Melrose VI.	957	7.3.13	14.3.13	273	16½	5,336	6·42	342¾	250	390½
Mystery of Melrose X.	Not yet allotted	7.3.13	14.3.13	273	11½	5,753¾	5·81	334¼	200	381
Handsome Girl of Melrose V.	,,	6.4.13	13.4.13	273	13¼	4,807¼	5·99	288	200	328¼
Blossom of Melrose III.	,,	1.6.13	8.6.13	273	20½	7,392¾	4·33	319½	250	364½
Flower of Melrose VIII.	,,	11.6.13	18.6.13	273	14¼	5,857¼	5·96	349	200	397¾
Fuchsia of Melrose VII.	,,	11.6.13	18.6.13	273	21¾	8,847	5·13	454¼	250	517¾
Graceful Duchess IX. of Melrose	,,	15.7.13	22.7.13	273	15	6,721¾	5·68	381¾	250	435¼
Pearl of Melrose ..	,,	28.7.13	4.8.13	273	20½	8,215½	4·91	403¾	250	460¼
Sweet Pansy of Melrose	1413	1.8.13	8.8.13	273	9¼	5,111	5·91	302¼	250	344½
Chevy VI. of Melrose ..	Not yet allotted	3.8.13	11.8.13	273	25½	7,033	5·00	351¾	250	400
Twilight II. of Melrose	,,	5.8.13	12.8.13	273	9	7,268½	3·80	276¼	250	315
Peerless VIII. of Melrose	,,	7.8.13	14.8.13	273	15¼	5,443	5·52	300¼	175	342¼
Empire IV. of Melrose ..	Not yet allotted	7.8.13	14.8.13	273	18½	7,787¾	5·64	439¾	250	501¼
Lady Elector of Melrose	1114	16.8.13	23.8.13	262	4	4,694¾	5·55	260¾	250	297¼
Vanilla V. of Melrose ..	Not yet allotted	20.8.13	27.8.13	273	13	7,679¼	5·17	397	200	452¾
Mystery IX. of Melrose	,,	20.8.13	27.8.13	273	17	6,306¾	6·19	390½	250	445¼
Jessie V. of Melrose ..	,,	21.8.13	28.8.13	273	24	7,487½	5·60	419¼	250	478
Jessie's Progress ..	,,	25.8.13	8.9.13‖	273	18½	6,379½	6·38	407	250	464
Snowy III. of Melrose	,,	4.9.13	11.9.13	273	17	5,475¼	4·93	269¾	175	307½
Mystery XIII. of Melrose	,,	1.9.13	13.9.13¶	273	11½	4,121½	7·94	292½	175	333¼
Handsome Girl III. of Melrose	1062	8.9.13	15.9.13	273	17½	7,542½	5·55	419	250	477½
Jessie X. of Melrose ..	Not yet *allotted*	13.9.13	20.9.13	273	13½	5,962	6·15	366¾	200	418¼
Peerless VI. of Melrose	,,	22.9.13	29.9.13	273	11	5,404½	5·98	323¼	250	368½

* Lost 87 days at beginning through weights not being recorded.
† Lost 63 days at beginning through weights not being recorded.
‡ Lost 50 days at beginning through weights not being recorded.
§ Lost 23 days at beginning through weights not being recorded.
‖ Entry deferred 7 days owing to sickness after calving.
¶ Entry deferred 5 days owing to premature calving.

Cows in Order of Merit.

Cows over 4 Years of Age.—250 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1st	Scottish Queen of Gowrie Park ..	2121	W. P. Brisbane ..	Ayrshire ..	12,022	4·87	585¼	667
2nd	Ida of Gowrie Park	2423	W. P. Brisbane ..	,, ..	10,867¾	5·10	555	632¼
3rd	Noreen	636	C. Gordon-Lyon ..	Jersey ..	11,427	4·58	523½	597
4th	Luxury	..	E. N. and S. O Wood	,, ..	8,791¼	5·73	503¾	574¼
5th	Sweet Bread XXIV. (Imp.) ..	..	C. D. Lloyd ..	,, ..	8,421	5·84	492¼	561
6th	Fuchsia of Melrose VII.	..	W. Woodmason ..	,, ..	8,847	5·13	454¼	517¾
7th	Empire IV. of Melrose	..	W. Woodmason ..	,, ..	7,787¾	5·64	439¾	501¼

COWS OVER 4 YEARS OF AGE—250 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
8th	Bonny Bess of Gowrie Park ..	2092	W. P. Brisbane ..	Ayrshire ..	9,716¼	4·49	436¾	498
9th	Wilful Venture	2974	P. E. Keam ..	Jersey ..	6,872	6·27	431¼	491½
10th	Blossom of Gowrie Park ..	2411	W. P. Brisbane ..	Ayrshire ..	8,693¾	4·94	429¾	489¾
11th	Honey of Gowrie Park ..	2422	W. P. Brisbane ..	.. ..	10,798¼	3·92	423¼	482½
12th	Jessie V. of Melrose	..	W. Woodmason ..	Jersey ..	7,487½	5·60	419¼	478
13th	Handsome Girl III. of Melrose ..	1062	W. Woodmason ..	.. ..	7,542¼	5·55	419	477½
14th	Linda of Gowrie Park	2426	W. P. Brisbane ..	Ayrshire ..	9,352	4·48	418¾	477½
15th	Jessie's Progress	..	W. Woodmason ..	Jersey ..	6,379½	6·38	407	464
16th	Pearl of Melrose	..	W. Woodmason ..	,, ..	8,215½	4·91	403¾	460¼
17th	Mystery IX. of Melrose ..	..	W. Woodmason ..	,, ..	6,306¾	6·19	390½	445¼
18th	Laura of Melrose VI.	..	W. Woodmason ..	,, ..	6,623½	5·86	388½	443
19th	Princess of Springhurst ..	2521	J. D. Read ..	,, ..	6,228¾	6·14	382¼	435¾
20th	Graceful Duchess IX. of Melrose	..	W. Woodmason ..	,, ..	6,721¾	5·68	381¾	435¼
21st	Molly II.	614	C. Gordon-Lyon ..	.. ..	7,429¼	4·97	369½	421½
22nd	*Dolly Varden of Gowrie Park* ..	2418	*W. P. Brisbane* ..	Ayrshire ..	8,232¼	4·46	366¾	418½
23rd	Muria	..	Department of Agriculture	Red Poll ..	7,287¼	5·00	364¾	415¾
24th	*Silvermine IV.*	716	*C. Gordon-Lyon* ..	Jersey ..	6,944	5·18	360	410¼
25th	Jenny Lind of Melrose VI. ..	..	W. Woodmason ..	.. ..	6,752	5·3	358½	408½
26th	Chaffinch of Gowrie Park ..	2413	W. P. Brisbane ..	Ayrshire ..	7,518½	4·75	357½	407½
27th	*Dewfall*	968	*P. E. Keam* ..	Jersey ..	7,647¾	4·67	357	407
28th	Hawthorn of Banyule	1064	C. Gordon-Lyon ..	,, ..	7,160¼	4·91	356	405¾
29th	Chevy VI. of Melrose	..	W. Woodmason ..	.. ..	7,033	5·00	351¾	400
30th	Trixie of Gowrie Park	2434	*W. P. Brisbane* ..	Ayrshire ..	8,151¼	4·29	350	399
31st	Princess of Gowrie Park ..	1710	W. P. Brisbane ..	,, ..	7,472¾	4·63	346½	395
32nd	Bullion	..	Department of Agriculture	Red Poll ..	8,026½	4·28	343¾	391¾
33rd	Daphne of Melrose VI. ..	957	W. Woodmason ..	Jersey ..	5,336	6·42	342¾	390½
34th	Virginia	..	Department of Agriculture	Red Poll ..	7,958½	4·29	341¼	389
35th	Dulcie of Springhurst	1878	J. D. Read ..	Jersey ..	5,981¾	5·68	339¾	387½
36th	Heather Duchess of Gowrie Park	1449	W. P. Brisbane ..	Ayrshire ..	7,112¼	4·77	339½	387
37th	Alsyke of Springhurst	1515	J. D. Read ..	Jersey ..	5,762½	5·82	335¼	382¼
38th	Cigarette	..	Department of Agriculture	Red Poll ..	8,167¾	4·08	333¼	380¼
39th	Waverley Lass	2793	F. Curnick ..	Jersey ..	6,788¼	4·86	329¾	376
40th	Patch of Gowrie Park	2430	W. P. Brisbane ..	Ayrshire	7,032¼	4·64	326¼	371¾
41st	*Mousie*	2388	*W. McGarvie* ..	Jersey ..	8,425	3·86	325	370½
42nd	Peerless of Melrose III. ..	2817	F. Curnick ..	,, ..	6,352½	5·09	323½	368¾
43rd	Peerless VI. of Melrose ..	..	W. Woodmason ..	,, ..	5,404½	5·98	323¼	368½
44th	*Brown Queen of Gowrie Park* ..	2412	*W. P. Brisbane* ..	*Ayrshire* ..	7,954	4·04	321¾	366¾
45th	Aggie	..	W. T. Manifold ..	Shorthorn	6,928¾	4·64	321½	366¾
46th	Dairymaid II. of Gowrie Park ..	2415	W. P. Brisbane ..	Ayrshire ..	7,237¾	4·44	321½	366¼
47th	*Aimie*	2408	*W. P. Brisbane* ..	.. ..	6,405½	4·99	320	364¾
48th	Blossom of Melrose III. ..	..	W. Woodmason ..	Jersey ..	7,392¾	4·33	319½	364¼
49th	Tabitha of Gleneira	..	F. J. Stansmore ..	Ayrshire ..	7,237¼	4·38	317	361¼
50th	Vuelta	..	Department of Agriculture	Red Poll ..	7,668	4·13	316¾	361
51st	Connecticut	..	Department of Agriculture	,, ..	7,155½	4·38	313½	357½
52nd	Ruby Lass of Gowrie Park ..	2433	W. P. Brisbane ..	Ayrshire ..	7,355½	4·26	313¼	357
53rd	Sweet Pansy of Melrose ..	1413	W. Woodmason ..	Jersey ..	5,111	5·91	302¼	344¾
54th	Clarice of Caulfield	..	F. J. Stansmore ..	Ayrshire ..	6,816¾	4·43	301¾	344
55th	Dora 1st	..	W. T. Manifold ..	Shorthorn	7,277	4·13	300¾	342¾
56th	Cuba	..	Department of Agriculture	Red Poll ..	6,582½	4·46	293¾	335
57th	Sumatra	..	Department of Agri*culture*	,, ..	7,005	4·18	293	334
58th	Marjorie	2294	W. McGarvie ..	Jersey ..	5,857	5·00	293	334
59th	Euroa of Springhurst	1918	J. D. Read ..	,, ..	5,461¾	5·35	292½	333½
60th	*Docility of Yalart*	..	*F. J. Stansmore* ..	*Ayrshire* ..	7,652¼	3·77	288¾	329¼
61st	Little Favourite of Gowrie Park	701	W. P. Brisbane ..	,, ..	7,590	3·77	286½	326½
62nd	Lassie	509	C. Gordon-Lyon ..	Jersey ..	5,820¼	4·91	286	326
63rd	Pansy of Yalart	..	F. J. Stansmore ..	Ayrshire ..	6,793	4·18	284¼	324¼
64th	Lottie	..	W. T. Manifold ..	Shorthorn	6,979	4·04	281¾	321
65th	Ethel of Gowrie Park	2419	W. P. Brisbane ..	Ayrshire ..	5,929¾	4·68	277¾	316¾
66th	Lady Brassey of Gowrie Park ..	2424	W. P. Brisbane ..	,, ..	5,839½	4·75	277½	316
67th	Silvermine III.	715	C. Gordon-Lyon ..	Jersey ..	5,554¾	4·98	276¾	315½
68th	Twilight II. of Melrose ..	..	W. Woodmason ..	,, ..	7,268½	3·80	276½	315
69th	Quaily of Gowrie Park	2431	W. P. Brisbane ..	Ayrshire ..	7,008	3·94	276	314¾
0th	Europa	..	Department of Agriculture	Red Poll ..	6,043	4·56	275¾	314¼
1st	Stockings of Springhurst ..	2663	J. D. Read ..	Jersey ..	5,102¾	5·36	273¾	312
2nd	Star II.	..	W. T. Manifold ..	Shorthorn	7,185¼	3·78	271½	309½
3rd	*Egypta*	..	*Department of Agriculture*	*Red Poll* ..	*6,304½*	4·27	269¼	307

COWS OVER 4 YEARS OF AGE—250 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs
74th	*Cuba*	...	*Department of Agriculture* ..	*Red Poll* ..	*6,288¾*	*4·28*	*269*	*306¾*
75th	Nice of Caulfield	2722	F. J. Stansmore ..	Ayrshire ..	5,076¾	5·30	269	306¾
76th	Corkscrew V.	..	W. T. Manifold ..	Shorthorn	6,757	3·91	264¼	301¼
77th	Havana	..	Department of Agriculture	Red Poll ..	6,364½	4·15	264¼	301
78th	Ida	..	W. T. Manifold ..	Shorthorn	6,578¼	4·01	263½	300¼
79th	Fairy of Gowrie Park	1707	W. P. Brisbane ..	Ayrshire ..	5,912¾	4·45	263¼	300¼
80th	Fairy of Willowvale	1354	W. P. Brisbane ..	.. ..	6,760¾	3·87	261½	298
81st	Lady Elector of Melrose ..	1114	W. Woodmason ..	Jersey ..	4,694¾	5·55	260¾	297¼
82nd	Dainty Polly of Gowrie Park ..	2414	W. P. Brisbane ..	Ayrshire ..	6,426	4·05	260½	297
83rd	Ruby of Inverkeil	...	F. J. Stansmore ..	.. ..	6,260¼	4·16	260½	297
84th	Rose of Yalart	1659	F. J. Stansmore ..	.. ..	6,662¼	3·85	256¾	292¾
85th	Kentucky	..	Department of Agriculture	Red Poll ..	6,249¼	4·09	256	291¾
86th	Nettle of Gowrie Park ..	2429	W. P. Brisbane ..	Ayrshire ..	6,073	4·20	255	290¼
87th	Graceful Magnet of Springhurst ..	2521	J. D. Read ..	Jersey ..	5,496¼	4·62	254¼	289¾
88th	Frolic of Glen Elgin	1817	Geelong Harbour Trust	Ayrshire ..	5,656½	4·46	252½	288
89th	*Ada of Caulfield*	...	*F. J. Stansmore* ..	.. ..	*69,57¼*	*3·61*	*251¼*	*286¼*
90th	Beauty of Springhurst ..	1567	J. D. Read ..	Jersey ..	4,462¼	5·64	251¼	286¾
91st	Flower of Melrose V.	..	W. Woodmason ..	.. ..	4,302¾	5·80	250¾	285¾
92nd	Dairymaid	...	W. T. Manifold ..	Shorthorn	7,104¾	3·53	250¾	285¾
93rd	*Kathleen of Gleneira	1732	F. J. Stansmore ..	Ayrshire ..	6,003½	3·75	225½	256¾

* This cow qualified under the old standard, requiring only 200 lbs. of butter fat.

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1st	*Kathleen III.*	*2140*	*C. Gordon-Lyon* ..	*Jersey* ..	*7,586¼*	*5·39*	*409½*	*466¾*
2nd	Vanilla V. of Melrose	..	W. Woodmason ..	.. ..	7,679¼	5·17	397	452¾
3rd	Jessie X. of Melrose	..	W. Woodmason ..	.. ..	5,962	6·15	366¾	418¼
4th	Audrey Lassie	825	C. Gordon-Lyon ..	.. ..	7,596½	4·74	360	410½
5th	Flower of Melrose VIII. ..	..	W. Woodmason ..	.. ..	5,857¼	5·96	349	397¾
6th	*Birdseye*	...	*Department of Agriculture*	*Red Poll* ..	*6,232¼*	*5·47*	*341*	*388¾*
7th	Mystery of Melrose X. ..	..	W. Woodmason ..	Jersey ..	5,753¾	5·81	334¼	381
8th	Persica	...	Department of Agriculture	Red Poll ..	6,686¼	4·53	302¾	345
9th	Mexicana	..	Department of Agriculture	.. ..	6,647¼	4·55	302¼	344¾
10th	Pansy of Springhurst	2441	J. D. Read ..	Jersey ..	5,950½	5·04	299¾	341¾
11th	Corkscrew VIII.	..	W. T. Manifold ..	Shorthorn	7,000¼	4·23	296¼	337¾
12th	*Handsome Girl of Melrose V.* ..	..	W. Woodmason ..	Jersey ..	4,807¼	5·99	288	328¼
13th	Tulip of Springhurst	2730	J. D. Read ..	.. ..	4,774¾	5·98	285¾	325¾
14th	Daphne of Springhurst ..	1803	J. D. Read ..	.. ..	4,949¼	5·77	285¾	325¾
15th	India	..	Department of Agriculture	Red Poll ..	6,150	4·37	268½	306¼
16th	*Bella of Yalart*	..	*F. J. Stansmore* ..	Ayrshire ..	*6,931*	3·84	266½	303¾
17th	Cowslip of Springhurst ..	..	J. D. Read ..	Jersey ..	5,252	4·94	259½	296
18th	White Star	2795	P. E. Keam ..	.. ..	4,174¾	6·13	256¼	292¼
19th	Royal of Gowrie Park ..	..	W. P. Brisbane ..	Ayrshire ..	6,063½	4·22	256	291¾
20th	Atlanta	..	Department of Agriculture	Red Poll ..	5,200¾	4·88	254	289½
21st	Daisy of Springhurst	1788	J. D. Read ..	Jersey ..	4,312½	5·88	253½	289
22nd	Turka	..	Department of Agriculture	Red Poll ..	5,431¾	4·66	253¼	288½
23rd	Actress of Gowrie Park ..	2407	W. P. Brisbane ..	Ayrshire ..	5,300½	4·63	245½	279¾
24th	Milkmaid of Rythdale ..	..	F. J. Stansmore ..	.. ..	5,620	4·34	244	278
25th	Nancy	..	F. J. Stansmore ..	.. ..	6,102	3·99	243¾	277¾
26th	Jessie of Melrose IX. ..	..	W. Woodmason ..	Jersey ..	4,233¾	5·67	240¼	274
27th	Lucina	..	C. D. Lloyd ..	.. ..	3,387½	6·76	229	261¼
28th	*Canna of Springhurst*	*1673*	*J. D. Read* ..	.. ..	*4,182*	*5·34*	*223½*	*254¾*
29th	Lady Flinders II.	..	F. J. Stansmore ..	Ayrshire ..	5,522¼	3·98	219¾	250½
30th	Silver Spinney	1388	C. Gordon Lyon ..	Jersey ..	3,955¾	5·54	219¼	249¾
31st	Ella	1894	W. McGarvie ..	.. ..	4,422	4·74	209¾	239
32nd	Bracelet II.	..	W. T. Manifold ..	Shorthorn	5,121	4·05	207½	236½

Heifers—175 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1st	Bloomer of Gowrie Park ..	2410	W. P. Brisbane ..	Ayrshire ..	8,138	4·62	375¾	428¾
2nd	Foxglove	..	J. D. Read ..	Jersey ..	6,073¾	5·44	329¾	376
3rd	Luxury II.	..	E. N. and S. O. Wood	" ..	6,177½	5·26	325¼	370¾
4th	Moonlight	..	W. P. Brisbane ..	Ayrshire ..	6,896	4·51	311	354½
5th	Goldleaf	..	Department of Agriculture	Red Poll ..	6,437¼	4·79	308½	351½
6th	Lady Grey V.	..	A. W. Jones ..	Ayrshire ..	5,437¾	5·62	305¾	348¾
7th	May B.	..	G. D. and H. S. Wood	Jersey ..	4,863	6·19	301¼	343¼
8th	Eva	..	F. Curnick ..	" ..	6,015¼	5·00	301	343¼
9th	Peerless VIII. of Melrose ..	..	W. Woodmason ..	" ..	5,443	5·52	300¼	342¼
10th	Nightshade of Springhurst ..	..	J. D. Read ..	" ..	5,963¾	4·97	296½	338¼
11th	Mystery XIII. of Melrose ..	..	W. Woodmason ..	" ..	4,121½	7·94	292½	333¼
12th	*Buttercup of Springhurst* ..	..	*J. D. Read* ..	" ..	*5,043¼*	*5·59*	*282*	*321½*
13th	Merlin	..	W. T. Manifold ..	Shorthorn	8,126	3·46	280¾	320¼
14th	Gladys of Gowrie Park ..	2421	W. P. Brisbane ..	Ayrshire ..	6,340½	4·39	278½	317½
15th	*Snowy III. of Melrose* ..	..	*W. Woodmason* ..	*Jersey* ..	*5,475¼*	*4·93*	*269¾*	*307½*
16th	Silver Audrey	1378	C. Gordon-Lyon ..	" ..	4,962¼	5·3	261¼	298
17th	Sunlight of Gowrie Park ..	..	W. P. Brisbane ..	Ayrshire ..	5,535	4·66	258	295¼
18th	Iris of Springhurst	..	J. D. Read ..	Jersey ..	4,785½	5·26	251¾	287
19th	Birdseye	..	Department of Agriculture	Red Poll ..	4,351½	5·75	250¼	285¼
20th	Jessie of Melrose XI.	..	W. Woodmason ..	Jersey ..	3,624½	6·5	235½	268½
21st	Silver Pride	1387	C. Gordon Lyon ..	" ..	4,950	4·7	232½	265
22nd	*Diamond of Gowrie Park* ..	..	*W. P. Brisbane* ..	*Ayrshire* ..	*4,738½*	*4·70*	*222¾*	*254*
23rd	Gaiety of Rythdale	..	F. J. Stansmore ..	" ..	4,988¾	4·30	215	245
24th	Empress of Gowrie Park ..	..	W. P. Brisbane ..	" ..	4,399½	4·82	212¼	242
25th	Colleen	..	Mrs. B. M. Beckwith	Dexter Kerry	4,363	4·67	203¾	232¼
26th	Ethel	..	W. T. Manifold ..	Short horn	5,408	3·74	202¼	230½
27th	Tit Willow	..	Mrs. B. M. Beckwith	Dexter Kerry	3,454	5·61	194	221
28th	Netherlana	..	Department of Agriculture	Red Poll ..	4,439¾	4·20	186½	212½
29th	Pewit of Rythdale	..	F. J. Stansmore ..	Ayrshire ..	4,404	4·43	185	211
30th	*Lulu of Yalart*	..	*F. J. Stansmore* ..	" ..	*4,073¼*	*4·49*	*182¾*	*208¼*

REGULATIONS CONCERNING HERD TESTING FOR THE GOVERNMENT CERTIFICATION OF STANDARD COWS.

ENTRANCE.

1. The owner of any herd of pure-bred dairy cattle may submit his herd for certification.

2. Only those cows registered in a recognised herd book or pure stock register will be accepted, and all such cows in the herd must be tested, with such exceptions as are set out in clauses 14, 15, and 16.

3. An annual fee of £1 per herd and 5s. per cow tested shall be paid to the Department of Agriculture on demand.

4. Any cow entered for certification and any calf the progeny of such cow may be branded in such manner as to insure identification, and all standard cows will be marked on the inside of an ear with the Government tattoo mark and an identification number.

LACTATION PERIOD.

5. Testing and recording shall occupy a period of nine calendar months, 273 days, commencing one week from date of calving, excepting under such circumstances as set forth in clause 18. This period shall be recognised as the official lactation period.

RECORDING.

6. The milk from each cow entered shall be weighed separately immediately after each milking by means of tested and approved scales, and the weight recorded on a printed chart supplied for the purpose, which shall remain the property of the Department. Such scales and chart shall be available for inspection by a Government Dairy Supervisor when required.*

SUPERVISION.

7. A Government Dairy Supervisor, under the direction of the Chief Veterinary Officer, will make periodical visits for the purpose of checking records and taking samples of milk for testing. There shall be not less than nine visits during the official lactation period, and not more than thirty days shall elapse between any two visits. Additional visits may be made at any time by the Supervisor for the purpose of taking supplementary records and samples for testing as often as may be deemed advisable.

8. Every facility shall be afforded Government Officers in carrying out their duties under these Regulations, and accommodation must be provided over night when required.

9. Particulars as to date of calving, service, drying-off, hours of milking, manner of feeding, must be supplied for record purposes on request of the Dairy Supervisor. If deemed necessary in any case, the owner may be called upon to furnish a statutory declaration as to the correctness of such or any particulars.

TESTING.

10. In collecting samples for testing, the morning and evening milk will be taken; the tests will be made by the Chemist for Agriculture or his Deputy from a composite sample containing quantities of the morning and evening milk proportionate to the respective yields, and the results, unless shown to be abnormal, shall be considered as the average for the period intervening since the next previous normal test. If apparently abnormal, the results may be discarded, and further samples taken and tests made.

STANDARD COWS.

11. Standard cows under these Regulations shall be those which, during the official lactation period, yield—

(*a*) in the case of cows commencing their first lactation period and being then under 3 years of age, 175 lbs. of butter fat;

(*b*) in the case of cows commencing their first lactation period and being then over 3 years of age, 200 lbs. of butter fat;

(*c*) in the case of cows commencing their second lactation period and being then under four years of age, 200 lbs. of butter fat;

(*d*) in the case of cows commencing their third or any subsequent lactation period or being over four years of age, 250 lbs. of butter fat.

CERTIFICATION.

12. A Government Certificate shall be issued in respect of all standard cows. Such certificate shall show the breed, the age at entry, brands, the official lactation period recorded, and date of completion, the weight of milk given, the amount of butter fat and commercial butter (estimated on a 14 per cent. overrun), and the weight of milk given on the last day of the official lactation period.

13. The Certificate issued in respect of any standard cow shall, if she attain the standard during any subsequent official lactation period, be returned to the Department, when a fresh certificate will be issued, which shall show her record for each and every lactation period in which she was tested.

EXEMPTIONS.

14. Cows eight years old or over whose yields have been recorded for three official lactation periods may be exempt.

15. Aged or injured cows in the herd at time of entry, and kept for breeding purposes, may be exempt on the recommendation of the Government Supervisor. Any injury interfering with lactation received subsequent to entry may be recorded on Certificate issued.

* During the progress of "drying-off" no weight of milk under 4 lbs. per day shall be credited to any cow.

16. Any cow which, on veterinary examination, is found to be affected with tuberculosis shall be withdrawn from the test, and her milk shall not be allowed to be used for sale, or for the preparation of any dairy produce for sale.

17. Any cow which, on veterinary examination, is found to be affected with actinomycosis of the udder, or any other disease or condition which may temporarily render her milk injurious, may remain in the herd for testing, but her milk shall not be used for sale or for the preparation of any dairy produce for sale without permission of the Supervisor.

18. When any newly-calved cow is rendered temporarily unfit for testing by being affected with milk fever, mammitis, retention of placentà, or other ailment affecting newly-calved cows, the period elapsing between the calving and entrance to the official lactation period may be extended on the recommendation of a Veterinary Officer or Supervisor, but such period shall not exceed one month from date of calving.

19. Any interpretation or decision in respect of these Regulations, or in respect of any matter concerning the Certification, which receives the written approval of the Director of Agriculture, shall be final.

20. Should the owner of any herd entered not conform to these Regulations, such herd shall be subject to disqualification for such period as the Minister shall determine. The Minister retains the right to withdraw any Certificate when, to his satisfaction, good and sufficient cause is shown.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY 1914-1915.

MONTHLY REPORT ENDING 14th AUGUST.

The month concluded the winter test (15th April to 14th August), and a fresh world's record has been established for the winter test by Mr. J. H. Gill, with a score of 565, which is 32 ahead of last year's record. The second prize winner, Mr. E. A. Lawson, has equalled last year's record of 533. The dry mash is proving its value by the excellent returns that are being obtained from the light breeds, Mr. W. N. O'Mullane's pen having laid 522 eggs, whilst Mr. E. A. Lawson's pen is second with 507 eggs. The heavy breeds, wet mash, have done splendid laying, the winners laying 502 eggs, a very creditable performance, and the second place being 494. In the heavy breeds, dry mash, Mr. D. Fisher's pen laid 431 eggs, and Mr. T. W. Coto's pen is second with 400 eggs.

Weather conditions have been at first very cold and frosty, with fine days, afterwards mild, with favorable conditions for egg laying, which resulted in several backward pens coming forward, while others that laid well at first have rested and increased again at the end of the month.

The feeding was exactly on the same lines as the former month, with the exception that an increased proportion of crushed maize was fed in frosty weather.

The health of the stock is excellent, being bright, alert, and eager for their food. Several birds have had to be isolated for minor troubles, but rapid recovery again enabled them to be placed into their pens.

One death occurred in pen 80, and one bird in pen 56 had to be destroyed.

A. Hart,
Chief Poultry Expert.

FOURTH EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concludes 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen.	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th July.	15th July to 14th August.	*Total* to date, 4 months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns ..	J. H. Gill	421	144	565	1
36	,, ..	E. A. Lawson	399	134	533	2
9	,, ..	J. J. West	375	126	501	3
10	,, ..	R. Hay	372	128	500	4
16	,, ..	*A. R. Simon*	338	137	475	5
37	,, ..	S. Brown	345	108	453	6
40	,, ..	J. Schwabb	325	121	446	7
17	,, ..	F. Doldissen	339	105	444	8
44	,, ..	A. Ross	317	125	442	9
8	,, ..	T. A. Pettigrove ..	336	99	435	} 10
26	,, ..	Mrs. H. Stevenson ..	359	76	435	}
45	,, ..	H. C. Brock	342	89	431	12
29	,, ..	V. Little	311	112	423	13
35	,, ..	W. Tatterson	302	120	422	14
33	,, ..	W. G. Osborne	300	120	420	15
19	,, ..	Marville Poultry Farm ..	317	102	419	16
4	,, ..	*Giddy and Son*	308	98	406	17
12	,, ..	A. H. Mould	304	98	402	18
23	,, ..	S. Buscumb	285	112	397	19
11	,, ..	C. J. Jackson	270	117	387	20
34	,, ..	W. A. Rennie	266	108	374	21
47	,, ..	*W. G. Swift*	*250*	*120*	*370*	22
28	,, ..	Utility Poultry Farm ..	264	101	365	} 23
13	,, ..	H. Hanbury	254	111	365	}
15	,, ..	E. Waldon ..	247	107	354	25
30	,, ..	G. W. Robbins . ..	247	101	348	26
1	,, ..	F. G. O'Bree . .	249	91	340	27
2	,,	J. C. Armstrong ..	234	105	339	28
48	,, ..	*Bennett and Chapman* ..	226	110	336	29
8	,, .	F. W. Brine .. .	227	107	334	30
24	,, ..	C. Pyke	234	99	333	31
22	,, ..	B. Mitchell	222	100	322	32
6	,, ..	C. R. Jones	213	94	307	33
32	,, .	*Gleadell Bros.* .. .	201	96	297	34
42	,, .	E. W. Hippe .. .	184	107	291	35
14	,, ..	F. C. *Western*	163	125	288	36
38	,, .	G. Hayman . .	232	54	286	37
20	,, ..	A. W. Hall .. .	190	88	278	38
21	,, ..	R. A. Lewis .. .	185	81	266	39
31	,, ..	E. H. Bridge .. .	210	53	263	40
18	,, ..	*All-lay Poultry Yards* .	173	87	260	41
49	,, .	A. Beer	162	76	238	42
41	,, ..	Doncaster Poultry Farm .	131	97	228	43
43	,, ..	G. Mayberry .. .	143	79	222	44
5	,, ..	A. Mowatt ..	107	114	221	45
27	,, ..	Walter M. Bayles	134	58	192	46
39	,, ..	R. L. Appleford .	125	59	184	47
46	,, ..	*C. L. Sharman* .. .	82	81	163	48
50	,, ..	F. G. Silbereisen .	95	59	154	49
7	,, ..	B. Cohen	89	55	144	50
		Total .. .	12,404	4,994	17,398	

Fourth Egg-laying Competition, 1914–1915—*continued.*

Pen.	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th July.	15th July to 14th August.	Total to date, 4 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash				
60	White Leghorns ..	W. N. O'Mullane ..	373	149	522	1
55	,, ..	E. A. Lawson	358	149	507	2
65	,, ..	W. G. Osborne	319	149	468	3
53	,, ..	C. Lawson	327	126	453	4
58	,, ..	Miss L. Stewart	311	109	420	5
51	,, ..	Moritz Bros.	279	91	370	6
61	,, ..	H. Hanbury	227	136	363	7
68	,, ..	E. W. Hippe	274	61	335	8
63	,, ..	Hanslow Bros.	214*	121	335	8
57	,, ..	J. Jackson	216	60	276	10
62	,, ..	A. Greenhalgh	221	54	275	11
70	,, ..	W. H. Robbins ..	150	117	267	12
69	,, ..	C. J. Beatty	211	50	261	13
67	,, ..	Walter M. Bayles ..	154	105	259	14
52	,, ..	Myola Poultry Farm ..	138	115	253	15
64	,, ..	E. A. Carne	158	91	249	16
54	,, ..	G. Carter	141	98	239	17
59	,, ..	F. G. Silberelsen ..	107	81	188	18
66	,, ..	S. Brown	78	52	130	10
		Total	4,256	1,914	6,170	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	Jas. McAllan	370	132	502	1
71	,, ..	J. Ogden	361	133	494	2
81	,, ..	D. Fisher	348	125	473	3
84	Rhode Island Reds	J. Mulgrove	323	131	454	4
89	Black Orpingtons ..	Marville Poultry Farm ..	284	154	438	5
88	,, ..	H. H. Pump	312	124	436	6
82	,, ..	J. H. Wright	322	107	429	7
76	,, ..	W. P. Eckermann ..	267	138	405	8
74	,, ..	S. Brown	246	118	364	0
72	,, ..	T. W. Coto	265	95	360	10
83	,, ..	Cowan Bros.	226	132	358	11
75	,, ..	Fairdeal Poultry Farm ..	238	114	352	12
78	Red Sussex ..	Jorgen Anderson ..	225	78	303	13
73	Black Orpingtons ..	J. A. McKinnon ..	177	107	284	14
87	,, ..	A. Douglas	180	95	275	15
85	Golden Wyandottes	J. C. Mickelburgh ..	161	86	247	16
86	Buff Wyandottes ..	W. G. Swift	141	52	193	17
79	Barred Plyth. Rocks	Bennett and Chapman ..	94	71	165	18
80	White Plyth. Rocks	Stranks Bros.	43	25	68	19
		Total	4,583	2,017	6,600	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	305	126	431	1
94	,, ..	T. W. Coto	319	81	400	2
98	,, ..	A. Greenhalgh	289	58	347	3
97	,, ..	Jas. McAllan	218	121	339	4
90	,, ..	J. H. Wright	169	152	321	5
91	,, ..	C. E. Graham	159	120	279	6
96	Rhode Island Reds	Myola Poultry Farm ..	121	126	247	7
93	Black Orpingtons ..	Myola Poultry Farm ..	111	116	227	8
92	,, ..	Fairdeal Poultry Farm ..	120	105	225	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	60	43	103	10
95	,, ..	C. L. Hewitt	44	12	56	11
		Total	1,915	1,060	2,975	

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ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Spraying.

The peach aphis will now have made its appearance in orchards which were not sprayed with the red oil emulsion in the winter. The tobacco solution will now be required, and this may be sprayed on as strongly as the grower wishes. If possible, the spraying should be repeated quickly after the first operation, so as to kill any aphides previously protected by the others, or any that may have only been weakened by the first operation.

The time has also arrived when spraying is needful for the prevention of all fungus diseases, such as shothole or scab, black spot, leaf rust, leaf curl, &c. In the case of these pests, "prevention is better than cure" is the invariable rule; and to delay beyond the correct period the application of the necessary sprays is to court disaster. For black spot of apple and pear, the spraying should be performed as soon as the earliest flowers are opening. For shothole and scab, the time to spray is before the flower petals expand; and the spraying may be repeated, if necessary, after the fruit has set.

For rust and leaf curl the spray should be applied before any sign of trouble appears on the foliage; thus, if the fungus were present during the previous season, it will be necessary to spray early to combat it successfully.

The basis of all successful fungicides is sulphate of copper or bluestone. Bordeaux mixture (a mixture of bluestone, lime, and water, known as the 6-4-40 formula) is used; the materials and quantities being 6 lbs. bluestone, 4 lbs. lime, and 40 gallons of water.

Another spray, and in some locations equally as successful in its results as the Boardeaux mixture, is the copper-soda spray, the proportions being 6 lbs. of bluestone, 8 lbs. washing soda, and 50 gallons of water. In each case, the materials should be separately dissolved, and then evenly and simultaneously mixed in a third vessel.

It is very urgent that the lime should be thoroughly fresh and quick, otherwise the spray mixture will give very inferior results. A second necessary point is that the copper sprays should be used as soon as they are made. Where these difficulties are experienced, or where the grower does not wish to make his own spray, there are quite a number of ready-made Bordeaux pastes and Bordeaux mixtures already on the market, which can be used with satisfactory results. In fact, the use of these has become fairly general, and it is not now the practice for growers to make their own sprays.

General.

Grafting should be carried out at once, whether for young trees or for re-working old ones. In connexion with this work, it is wise to cut back the trees some time before the operation is performed. Then, when the grafting is carried out, the dead ends may be cut off, and the

grafts inserted in the new cuts. If the ground is at all warm, all varieties of citrus trees may be planted. The soil requires to be very sweet and well drained.

CULTIVATION.

It is most important that ploughing should be completed as early as possible. In the past, it has very frequently happened that, owing to delaying the ploughing, the orchard and the fruit crop have both suffered very considerably. It is absolutely necessary to cultivate the surface early, to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less amount of moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. Early ploughing gives exactly opposite results; the earlier the ploughing, the more soil water is conserved.

When the ploughing is completed, the clods should be crushed, and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed.

All cover crops planted to supply humus to the soil should now be ploughed in. If the plants are of a leguminous nature, the best time to plough these in is when they are in full flower. If the growth has been at all excessive or rank, the crop may be rolled before ploughing; or it may be mowed or cut with a mowing machine. Every care should be taken that the plants will be well distributed throughout the soil, and large quantities in a mass should not be ploughed under. Artificial and stable manures may also be given to the trees at this time. These should be applied before ploughing.

Vegetable Garden.

The vegetable plots should be cleaned from all weeds, having the light weeds dug in and the stronger ones pulled out and rotted in the compost heap. The surface should be worked up to a very fine tilth after digging; it must be kept constantly loose with the hoe to keep the soil cool; and prior to digging it will be advantageous to give a top dressing of lime.

If the weather be dry or windy, all newly-planted plants should be frequently watered. In transplanting seedlings, it is a help to dip the whole plant in water before planting.

Any seedlings that are ready may be planted out; tomato plants may be planted out under shelter until the frosts are over. At the end of the month a sowing of French bean seeds may be made. Seeds of peas, broad beans, beet, cabbage, kohl rabi, radish, turnip, cauliflower, lettuce, carrot, parsnip, &c., may be sown in the open. Seeds of melons, cucumbers, pumpkins, marrows, and similar plants may be planted in frames for transplanting after the frosts have gone.

Flower Garden.

After digging, the surface must be kept constantly stirred with the hoe, so as to have it loose and friable for cooling and for moisture-conserving purposes. All weeds must be kept down, as they are robbers

of plant food and moisture at this season of the year. Shrubs of all kinds may still be planted out, and these should be well watered after planting.

Rose and other aphides must be watched for, and treated according to instructions given in last month's notes. Rose scale should be sprayed with lime-sulphur wash, or with kerosene emulsion. This pest will soon disappear if the bushes are kept open to admit the air and the sunlight freely. Rose mildew will now be appearing, and the plants as well as the soil should be sprinkled with liberal dustings of sulphur. Sulphide of potassium is also a good specific for this fungus trouble, using it at the rate of 1 ounce to 3 gallons of water.

Cannas, early chrysanthemums, and early dahlia tubers may be planted out, as well as all kinds of herbaceous plants, such as *delphiniums, perennial phlox, asters, &c. The clumps of these should* be well divided, and in planting they should be fed with a liberal quantity of stable manure. Beds should be prepared and well dug over for exhibition chrysanthemums and dahlias.

Wattles of all kinds may be planted out, and many of these are suitable for garden work. For trees, Acacia Baileyana (Cootamundra), A. saligna (West Australian willow wattle), A. spectabilis (weeping), A. verniciflua, A. prominens, A. leprosa, A. longifolia, A. cultriformis, A. elata, A. decurrens, variety normalis, A. linifolia, A. iteaphylla, A. Maidenii, and A. retinodes are all useful. While as shrubs, the following may be grown:—A. discolor, A. longifolia, variety sophorae, A. *suaveolens, A. Farnesiana, A. myrtifolia, A. acinacea, A. Mitchelli, A.* podylarifolia, and A. Howittii.

Acacias may be readily pruned, the work being done after flowering; and if this work be commenced when the plants are fairly young, they may be trained into beautiful and shapely bushes and trees.

It is also a good time to sow the seed. The outer covering of acacia seeds is very hard, and the growing root is not able of its own accord to penetrate it. The seed must therefore be immersed for a few moments in boiling water, and allowed to soak for at least twelve hours. After this, they may be planted direct into the garden or into pots for subsequent transplanting.

QUESTION AND ANSWER.

"Irrigator" asks *if Berseem Clover is annual or perennial: if annual, will it* seed itself like trefoil, or must the ground be worked up and collected seed sown.

Answer.—Berseem is (1) an annual: (2) the ground must be worked up, and seed sown for each crop each year.

REMINDERS FOR OCTOBER.

LIVE STOCK.

Horses.—Continue to feed stabled horses well: add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares in foal should be put on poorer pasture. Mares with foal at foot should receive a good ration of oats daily. Mares intended for breeding, if not already stinted, should be put to the horse.

CATTLE.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a warm dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half a cup of limewater in the milk to each calf, also place oats or lucerne hay in a trough so that they can eat at will.

PIGS.—Supply plenty of bedding in warm well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible.

SHEEP.—Avoid excessive dust in yarding sheep for shearing. Well bred fleeces free from dust and burr should be skirted carefully, the better the class of wool the greater the need. Fleeces that are dry and earthy on the backs need only stains removing, there is no advantage in removing burr on these. It is better management to have ample table room, and extra men skirting carefully, than to hurriedly tear off unnecessary wool and then employ men at the piece table to sort what is known as "broken fleece" or "first pieces." All stains must come off fleeces, and wether "pizzle" stains from bellies. With crossbreds, separate all coarse fleeces from the finer sorts; and, with merinoes, the yellow and mushy ones from the shafty and bright. Skirt off any rough thighs from crossbred fleeces and keep separate. Press in neat bales; avoid "sew-downs." Brand neatly. Lambs not fit for export shear at once.

POULTRY.—The bulk of incubation should cease this month—late chickens are not profitable. Devote attention to the chickens already hatched; avoid overcrowding. Feed with dry mash. Also add plenty of green food to ration, ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize, and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as possible; tainted ground will retard development.

CULTIVATION.

FARM.—Plant main crops of potatoes in early districts and prepare land for main crop in late districts. Fallow and work early fallow. Sow maize and millets where frosts are not late, also mangolds, beet, carrots, and turnips. Sow tobacco beds and keep covered with straw or hessian.

ORCHARD.—Ploughing and cultivating to be continued, bringing surface to a good tilth, and suppressing all weeds. Spray with nicotine solution for peach aphis, with Bordeaux mixture for black spot of apple and pear, and with arsenate of lead for codlin moth in early districts.

VEGETABLE GARDEN.—Sow seeds of carrot, turnip, parsnip, cabbage, peas, French beans, tomato, celery, radish, marrow, and pumpkins. Plant out seedlings from former sowings. Keep the surface well pulverized.

FLOWER GARDEN.—Keep the weeds down and the soil open by continued hoeing. Plant out delphiniums, chrysanthemums, salvia, early dahlias, &c. Prepare ground for digging and manuring for autumn dahlias. Plant gladioli tubers and seeds of tender annuals. Spray roses for aphis and mildew.

VINEYARD.—This is the best month for *field grafting*. If stocks bleed too copiously, cut off 24 hours before grafting. Field grafts *must* be staked, to avoid subsequent straining by wind and to insure straight stem for future vine. Stakes are also necessary for grafted rootlings for same reasons. Temporary stakes 3 feet long will suffice. Keep a sharp look out for cut worms. (See *Journal* for July, 1911, and also October, 1913.) Disbud and tie up all vines, giving special care to young plantations. Beware of spring frosts. (See *Journal* for September, 1910.)

Conclude spring cultivation (second ploughing or scarifying and digging or hoeing round vines). Weeds must be mastered and whole surface got into good tilth. Sulphur vines when shoots 4 to 6 inches long.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

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IRRIGATION WORKS IN ITALY.

Paper prepared for the Australian Congress of the British Association by Professor Luigi Luiggi, D.Sc., M.Inst.C.E., President of the Italian Society of Civil Engineers.

I.—Generalities.

The average tourist who visits Italy and admires the splendid orange groves of Sicily and Calabria, the industrial cultivation of flowers of the Ligurian Riviera, the luxurious vegetable gardens and orchards of Tuscany and Campania, or the extensive meadows of exuberant trefoil and lucerne, green all the year round, of Lombardy and Lower Piedmont, if he has any feeling of poetry in his veins, will be inclined to raise a hymn of praise to Providence for bestowing upon Italy such great blessings, and forget entirely the industry of its inhabitants, often wrongly suspected of the sins of "*dolce far niente.*"

And truly Italy has been greatly favoured with a mild climate, and plenty of sunshine—on the average 2,900 hours in the year, and even more in some parts. But beyond this, Providence has not done much more for Italy than for any other nation of Southern Europe—Spain or Greece, for instance—but Providence has given her a very hardy race of people, full of resource, very thrifty, content with little, and ready to till the land cheerfully from dawn to dusk, in the hope of getting good crops. Notwithstanding the numerous drawbacks of a rather poor soil and of a very irregular rainfall—in excess during the winter months, when it causes inundations, and nearly absent from five to seven months in summer, when a fierce sun scorches the land and dries up all vegetation—the industry of the Italian farmer has overcome these natural drawbacks by a rational system of irrigation.

Importance of Irrigation.—And in fact the prosperity of agriculture in the regions just mentioned, which are the most prosperous in Italy, is

due exclusively to the incessant work of men who, far from enjoying much "dolce far niente," have applied, and are extending continually, the art of irrigation, which in Italy dates back to the time of the Etruscans and the Romans, and has reached, indeed, great perfection in our days.

Without irrigation, the marvellous orange groves, the beautiful orchards and vegetable gardens, which give such valuable products for export to Central Europe, and even to North America, could not exist, and the land would produce but a scanty revenue to its owners without it. *The luxurious and extensive meadows of the valley of the Po—intensely green all the year round,* and which give even seven or eight crops of fodder per year—would only barely give two cuttings of grass in ordinary years, because the land during the long period of the hot season remains generally without any rain to speak of, and the vegetation is dried up by a fierce sun that scorches up everything. On the other hand, during the winter months the rain would flood many regions *of Italy and make them unfit for cultivation, if the water was not conveniently regulated by dams and dykes or other works, some of great* magnitude.

It is the art of the hydraulic engineer and the intelligence and perseverance of the agriculturist that, by regulating the natural watercourses between training dykes, or impounding the flood-water into reservoirs, formed by high dams, or raising the water from the subsoil or from the natural streams, and then distributing this water intelligently over the land at the proper time, and in the proportion most *adapted for the different crops—that is, by scientific irrigation*—that the waste sandy plans of Piedmont and Lombardy were transformed into the most prosperous meadows and rice fields, and the orange groves around the Thyrrenean coasts became so abundant and beautiful, that Goethe called Italy "the land where the orange blooms."

How the Italian Experience can be Useful to Australia.—From this it can be seen that the climatic conditions of Italy are very similar to those of Australia, so it may be of interest—and it is hoped of use also—*to the citizens of the Commonwealth to know how Italians have managed to get the best out of the natural conditions of their native land,* a country which has practically no mines or other resources to speak of, but depends entirely on the products of the soil for its principal source of revenue, and how its people have brought agriculture, combined with irrigation, to a very advanced state of progress.

Importance of Italian Irrigation.—The whole surface of Italy can be divided thus:—

Regions.	Square kilometres.*	Proportion.	Surface in acres.	Cultivated Fields.	Meadow Land.	Forest Land.
		per cent.		square kilometres.	square kilometres.	square kilometres.
Mountains ..	103,649	37	25 500,000	29,419	33,438	29,732
Hills ..	122,174	42	30 000,000	36,175	22,400	24,899
Plains ..	60,859	21	15,000,000	15,269	10,312	33,345
Total surface	286,682	100	70,500,000	80,863	66,150	87,976
				28 %	23 %	30 %

* A kilometre equals 3 280·8 feet or 0·621 of a mile.

Thus 235,008 square kilometres are used for agriculture. The rest, or 51,674 square kilometres, are rocks, glaciers, marshes, or sand-dunes, unfit for cultivation, representing 19 per cent. of the whole surface of Italy.

Of the plains, or flat lands, along the valleys, about 14,000 square kilometres (3,458,000 acres) are irrigated, and of these 12,000 square

Fig. 1.—Italian irrigation systems.

kilometres (2,961,000 acres) are in Northern Italy, between the Alps and Apennines, in the valley of the River Po, which feeds abundantly the irrigating canals. The other 2,000 square kilometres (494,000 acres) are in Southern Italy, where water is very scarce, and has to be derived mainly from underground or from artificial reservoirs.

In this way agriculture, with the aid of irrigation, even when applied to a poor soil, leaves a fair margin of profit, sufficient to be invested in further improvements of the land or of the towns, or in other works of comfort or of beauty. And this process, repeated almost continuously for twenty-five centuries—that is from the time of the Etruscans and the Romans, through the Middle Ages, up to our days—has made Italy what she is now, the land of arts, of music, of monuments, notwithstanding all the wars and vicissitudes she has gone through.

Irrigation is the principal factor of the success of Italian agriculture and of the present progress of the nation; so it is important to know how it is applied; that is, how the water is provided, how it is distributed over fields, and the results, technical and economical, that irrigation gives.

Fig. 2.—A typical "Noria" and tank for irrigating orange groves, olives, vines, &c.

II.—How the Water for Irrigation is Provided.

(A) *Underground Water Raised from Wells.*—When only small quantities of water are required—as for the cultivation of flowers for industrial purposes, or for orange groves or similar garden products of high commercial value—the water is generally derived from wells dug in the sandy subsoil at the foot of the hills and round the coasts, and is raised either by very primitive means, such as "water buckets" (cicogna, altalena), worked by hand, very similar to the Egyptian "Shadouf," that can lift the water 2 to 4 metres (7 to 14 feet) high, or with "*Norias*" (Fig. 2) or rotary pumps moved by animals, raising the water up to 5 or 6 metres (16 to 20 feet), and sometimes up to 10-12 metres (33 to 39 feet), and these are very common, especially in South Italy.

In the North, instead, small, but very modern, centrifugal pumps, driven by oil or electric motors, are more in use, generally from about 2 to 5 horse-power, lifting the water up to 10-12 metres (33 to 39 feet), and exceptionally up to 40 metres (130 feet). These can be seen in large numbers along the Ligurian Riviera, and in many parts of the valley of the Po, where there are many hydro-electric plants that during day-time sell the current at very low rates.

The cost of the water raised by manual labour varies from 0.10 to 0.15 francs per cubic meter (4½d. to 6¾d. per 1,000 gallons) for lifts between 2 and 4 metres (7 to 14 feet); if raised by "norias" worked by animals, the cost varies from 0.04 to 0.10 francs per cubic metre (1¾d. to 4½d. per 1,000 gallons) according to the lift, from 6 metres to 12 metres (20 to 39 feet); if raised by oil motors, the average is 0.04 francs (1¾d.), and by electric motors 0.02 francs per cubic metre (1d. per 1,000 gallons) for lifts up to 10-12 metres (33 to 39 feet); and it reaches 0.10 to 0.15 francs (4½d. to 6¾d. per 1,000 gallons) for lifts up to 40 metres (about 130 feet or more).

Although the cost of the water is so great—and it is not unusual to pay from 0.25 to 0.30 francs a cubic metre (1s. to 1s. 2d. per 1,000 gallons), and sometimes even 0.40 francs per cubic metre (1s. 6d. per 1,000 gallons)—still the irrigation is done with such great care and minute economy, that only from 2,000 to 3,000 cubic metres are required per year per hectare* (25,200 to 41,600 cubic feet per acre), and products grown in this way—such as flowers, oranges, early vegetables, special classes of prime fruits, &c.—realize such high prices that this expenditure is fully justified, and leaves a very fair profit to the growers of all these delicacies, which find a ready market in Central and Northern Europe, especially during the winter months. The yearly revenue of a good orange grove of Sicily varies from 1,500 to 2,000 francs, and sometimes even 3,000 francs per hectare (£30 to £54 per acre) per year, whilst the same land not irrigated, and only in condition to be cultivated with vines, olives, &c., pays rents ranging from about 160 to 250 francs per hectare (£2 12s. to £4 per acre). All the good plots of land from Taggia to San Remo, in the Ligurian Riviera, are planted with violets, roses, and especially carnations, "garofani," and give a gross yearly revenue from 5,000 to 12,000 francs per hectare (£80 to £190 per acre). These, however, are especially favoured strips of land, in a region of perpetual spring, where the land produces all the year round, and the skilled gardeners are untiring in their labour.

(B) *Water Derived from Infiltration Tunnels.*—Some parts of the Roman Campagna, and also round Naples, are literally honeycombed with a net work of narrow tunnels† (a great many of Etruscan and Roman origin are still in good working order) that collect and bring to the surface at a lower level the rain water that percolates through the fissured volcanic formation of these regions. These tunnels are simply excavated through the "tufa," without any linings; their cross section is only just sufficient for a man to pass through; generally it is 1 ft. 8 in. by 6 feet, and in some cases even only 1 ft. 2 in. by 5 ft. 6 in.; at every 50 to 100 yards there is a ventilating shaft, used also for repairs.

Many similar tunnels exist also in other regions of Italy, where the ground is composed of "conglomerate," and are called "pozzi allac-

* A hectare equals 2·471 acres.
† D'Ossat.—I cunicoli della Campagna Romana.—Atti Società Ingegneri. Roma, 1900.

ciati*, or "connected wells." These serve for irrigating small plots of land.

The most interesting, however, are the "infiltration tunnels" (gallerie filtranti) of Southern Italy, which play a very important part in the cultivation of oranges, early vegetables, and similar high-priced products.

There are some regions, especially in Sicily and Calabria, with large valleys filled with deep deposits of alluvium, which during the rainy season become saturated with water, almost forming an underground reservoir, which percolates slowly in the form of underground drainage. In these cases it is usual to drive a small tunnel† in a oblique direction, so as to intercept this underflow—taking advantage of the altrimetric conditions, and of a fall generally of 3 in 1,000 in the tunnel. The water comes naturally to the surface, and can be distributed over the fields at a lower level without any need of pumping. These "gallerie filtranti"‡ are often several hundred yards long, have a net internal section of 1.80 x 0.60 metres (6 feet by 2 feet), and are lined with porous masonry, but with an impermeable bottom of concrete. Their cost varies from 75 to 100 francs (£3 to £4) a lineal metre (3 ft. 3 in.). The total cost of such tunnels varies from about 20,000 to 40,000 francs each (£800 to £1,600), and one can obtain from 1,000 to 2,500 cubic metres (290,000 to 550,000 gallons) of water per day. Thus the cubic metre of water costs considerably less than that raised by electric power, and a fraction of that by animal or manual labour.

One of these infiltration tunnels at Mazzara§ gives 100 litres (22 gallons) per second, and serves to irrigate some 220 hectares (about 500 acres) of orange groves and vegetable gardens; and another, the largest in Sicily, at Zappulla, gives nearly double this quantity. As its total cost was 150,000 francs (£6,000), the actual cost of the water is very small indeed, being only the interest on the capital and expenses for maintenance of the tunnel. Reckoning these at 10 per cent. per year, the cost of the water is about 0.005 francs per cubic metre (¼d. per 1,000 gallons).

In cases of narrow gorges, in some places a sort of underground dam of puddled clay is built across the bed of the torrent so as to stop the underflow; thus the water rises to the surface and can be utilized for irrigation with less cost than for a tunnel. A good example of these subterranean dams ("dighe subalvee") is at Trabia,‖ in Sicily.

(B[1]) In some parts of Lombardy also, and in the province of Modena, there are large volumes of water flowing underground from the lakes or the mountains to the River Po, and the altrimetric conditions of the ground are such that the water can easily be tapped by ordinary wells of about 20 or 30 feet diameter and conveyed by a deep cutting to the surface of the fields at a lower level, thus forming a sort of artificial spring called "Fontanile"¶ almost similar, but not to be mistaken with an artesian well. Some of these fontanili give water enough to irrigate several thousand acres of meadow lands called "Marcite," which

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* Luiggi.—I pozzi allacciati del' Isola di Cipro.—Giornale Genio Civile. Roma, 1880.
† Bionda.—Le Gallerie filtranti della Provincia di Messina. Roma, 1908.
‡ Torricelli.—Gallerie filtranti longitudinali. Roma, 1888.
§ Mayer.—L'acqua per irrigazione. Naples, 1914. Pag. 204.
‖ Capitò.—Dighe subalvee.—Giornale Genio Civile. Roma, 1883.
¶ Lombardini.—I fontanili della Lombardia. Milano, 1863.

are considered the most valuable meadows in Italy. As these underground waters have a temperature of about 56 deg. to 60 deg. Fahr. in winter time—when the land sometimes is covered with snow—the meadows, or *marcite*, abundantly irrigated with this water, are intensely green, forming a striking contrast in the landscape.

Thanks to the comparative warmth of the water, these special super-irrigated meadows can give regularly seven, and even eight, cuttings of grass per year; that is, from 80 to 100 tons of lucerne grass per year per hectare of "marcita," which is an exceedingly large product.

(c) *Storage of Rain Water by Means of Reservoirs.*—The irrigation above mentioned is possible only in especially favoured localities, but, except in a few cases, the amount of water is generally very small, less than 10 cubic feet per second. When larger quantities are required it is better to store up—by means of impounding reservoirs—the rain water which falls during the winter months, and averages from 36 inches in the North of Italy, to 20 inches in the South.

During the warm season the rainfall is very scanty, and of little benefit to the land.

These impounding reservoirs may vary from the modest cistern of some few hundred cubic metres capacity, built of solid masonry, to small ponds or "tanks," called "serbatoi a corona," of some 20,000 to 100,000 cubic metres (30,000 to 150,000 cubic yards) capacity, or even large reservoirs, or artificial lakes, of many millions.

For instance, one of the latter, now in construction on the River Tirso, in Sardinia, with a dam 55 metres (185 feet) high, will impound 350 million cubic metres (437 million cubic yards) of water, and will be, for the present, the largest in Europe. It will, however, be surpassed by two similar reservoirs, soon to be commenced on the Bradano (dam 60 metres, or 200 feet high) and Fortore (dam 75 metres, or 250 feet high), in Apulia, and by a third on the Simeto (dam 50 metres, or 170 feet high) in Sicily, which will be able to store up respectively 512 million, 487 million, and 450 million cubic yards of rain water. Thus the winter floods in those regions will be diminished, and the water stored up for irrigation will be distributed on the plains traversed by these rivers, which, now almost a curse, but, when regulated, will be a blessing to the farmers.

(d) *Small Reservoirs, or "Tanks."*—These small artificial "tanks," as they are called in India, or "serbatoi a corona,"* are especially popular in the province of Piacenza. They are formed by surrounding some natural depression of very bad clayey land with earthen dykes 12 to 16 feet high, and from 1 to even 2 miles long, provided with an outlet of masonry, closed by a sluice gate. Usually they cover an area from 4 to 5 hectares (about 9 to 11 acres) with water 2.50 to 3.50 metres (8 to 12 feet) deep, sufficient to irrigate sparingly, on the average, about 8 to 9 hectares (17 to 20 acres) of meadows, at the rate of about 7,000 cubic metres of water per hectare (620,000 gallons per acre per year). This corresponds to a height of water of about 0.70 metres (28 inches) distributed over the land during the five to seven months of dry season. This water is applied in "rotations" of about 40,000 to 50,000 gallons per acre every twelve-fourteen days, and the cost of irrigation comes to about 90 to 100 francs per hectare per year (£1 15s. to £1 18s. per acre),

* Raineri.—*I Serbatoi a corona.—Federazione Agricola italiana.* Piacenza, 1907.

or at the rate of 0.012 francs a cubic metre (½d. per 1,000 gallons), which is notably less than that of the water raised from underground.

Some of these artificial ponds are even larger; that of Temavasio, for example, is 20 ha. (49 acres) in surface, and stores water 5 metres (16 feet) deep, sufficient to irrigate—very sparingly, but sufficiently—during six to seven months about 50 ha. (123 acres) of meadows.

The capital cost of these ponds per cubic metre of water stored is about 0.20 to 0.25 francs (from 9d. to 1s. per 1,000 gallons), including all expenses, and the cost of the water, including interest and all other expenses, and also distribution over the land, comes to about 0.012 to 0.016 lire per cubic metre (½d. to ¾d. per 1,000 gallons).

This price is, however, still too high for irrigation on a large scale, and, besides, the quantity of water thus stored is still comparatively very small, and, as the water has to be used with great economy, the grass during the hottest months suffers somewhat from the drought.

(E) *Storage of Water in Large Artificial Lakes.*—Thus larger reservoirs, or artificial lakes, of many million cubic metres capacity, have been formed in several valleys of the Alps, or of the Apennines, by high dams, built either of earth, rockfill, or masonry, the latter being generally preferred.

In fact, except for the small reservoirs, or "tanks," just described, earth dams are not popular in Italy, and are rarely built higher than 30 to 40 feet. The only high earth dam is at Lagastrello, in the province of Parma. It is 21 metres high (69½ feet), 170 metres (550 feet) long on the crest, and forms a reservoir of 3 million cubic metres (657 million gallons) capacity. As a rule, owing to the peculiar climatic condition of its water-shed, this reservoir is filled about three or four times a year by the exceptional rains of the region, so really it acts as if its volume was 9 to 12 million cubic metres, and thus the unit cost of the impounding capacity of the reservoir is much smaller. Its total cost was 620,000 francs (£24,500), and the cost of a cubic metre of water impounded comes to about 0.20 francs per cubic metre (9d. per 1,000 gallons). The water is drawn at the rate of 1 cubic metre per second, and utilized first for an hydro-electric installation of about 10,000 horse-power, and then used for irrigation.

It may be well here to add that all the water from the large reservoirs of Italy serves first for hydro-electric power, and afterwards for irrigation, otherwise it would not be possible to pay the interest on the capital invested; and even then the State has to encourage these enterprises by granting a subsidy that in some cases reaches 3 per cent. per year during the first ten years, 2 per cent. and 1 per cent. per year during the following decades. This, capitalized at the rate of 5 per cent. interest, makes an initial grant of 35 per cent. on the capital invested. The grant, however, is given on condition that the water for irrigation will not cost more than 0.01 francs per cubic metre (4½d. per 1,000 gallons); but generally it is sold at much less, otherwise the farmers could not afford the expense.

Just now Parliament is considering the advisability of increasing this subsidy to 3,000 francs (£120) per annum per fifty years for each million cubic metres (35 million cubic feet) of water capacity of the lake. At the end of sixty years the reservoir and distributing canals become the property of the State.

The other type of dam which is coming into favour in Italy—because of its low cost and resistance, even to earthquakes, not infrequent in Southern Italy—is the rockfall dam* (Fig. 3). There are already three good examples of these rockfill dams, built recently at Lago d'Alpone (Montcenis), at Biaschina (Tessin), and at Devero (Domodossola). The latter, which is the most important, is 31 metres (101 feet) high, 115 metres long (365 feet) on the crest, and is formed by a mass of large stones, roughly packed with smaller ones, and revetted on the water slope by a layer of very accurate cement masonry, made still more impermeable by a double layer of asphalt sheeting, protected by granite pitching set in mortar. The volume of the reservoir is 13 million cubic metres, and its cost was 868,000 francs (£35,000), or 0.07 francs per cubic metre (3¼d. per 1,000 gallons) storage capacity.

The Brasimone dam, in the Province of Bologna, is one of the best type of Italian masonry dams (the Tirso, Bradano, and Fortore dams are planned on the same lines). It is 34 metres (112 feet) high, 158 metres (530 feet) long on the crest, and has a volume of 40,000 cubic

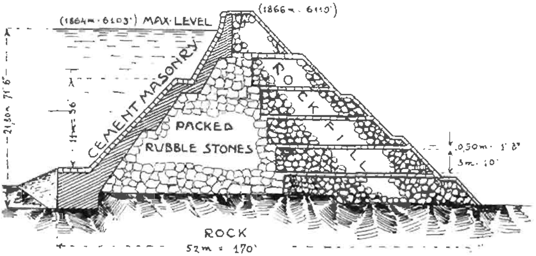


Fig. 3.—Rock-fill dam at Devero.

metres (about 50,000 cubic yards) of masonry. It is calculated as a gravity dam, but, for greater safety, it is very arched in plan, following a radius of 75 metres (250 feet), with an angle at centre of 126 deg. Its section is considered quite up to date, combining the maximum of safety with proper economy; its cost was 800,000 francs (£32,000), with accessories, and the volume of the reservoir is 5,600,000 cubic metres, and the cost is 0.14 francs per cubic metre (6¼d. per 1,000 gallons) storage capacity of the reservoir.

Another interesting dam, very daring in design, and with a cross section, very similar to the concrete dams built by Mr. Wade, in Australia, is that of Corfino (Fig. 4), in the Province of Luccà. It is not a gravity dam, but an arched dam, 35 metres (116 feet) high, with a radius of 23 metres (75 feet), and central angle of 140 degrees. Its thickness on the crest is only 1.50 metres (5 feet), and at the base is of 7 metres (23 feet). It was built in sixty-five days, by pouring Portland cement concrete, 1 : 2 : 4, rather wet, into the wooden moulds. It gave very good results both technically and financially, and its cost was only 150,000

* See Luiggi.—Le dighe di scogliera (rockfill dams) per le regioni sismiche. Roma, 1914.

francs (£6,000), its capacity being 800,000 cubic metres; the unit cost is 0.25 francs per cubic metre (6d. per 1,000 gallons) of storage capacity.

Another important group of five dams, just finished, on the River Gorzente, near Genova, includes the Badana dam, 56 metres (188 feet) high—at present the highest in Italy. It is 215 metres (715 feet) long on the crest, has a volume of masonry of 100,000 cubic metres (132,000 cubic yards), and its cost was 2,325,000 francs (£93,000). It forms a lake of 450,000 cubic metres capacity, thus the unit cost of the water impounded is 0.49 francs per cubic metre (1s. 10d. per 1,000 gallons). A special feature of the dams of this group is that the flood water is not discharged over the usual spillways, but by means of a series of automatic syphons (Figs. 5 and 6). In the Badana dam there are six syphons, with a total discharge of 90 cubic metres per second (3,150 sec.-feet). In the Lagolungo dam there are ten syphons that can discharge 150 cubic metres (5,250 sec.-feet).

This is perhaps the largest group of automatic syphons existing, and they have given excellent results for several years past.*

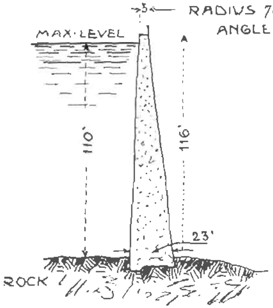


Fig. 4.—Corfino arched dam (made of Portland cement concrete not armoured).

However, the most important Italian reservoir, as already stated, is now in construction on the River Tirso, Sardinia, with the triple object (*a*) of regulating the floods of this torrential river, which has a maximum discharge of nearly 1,300 cubic metres (45,500 sec.-feet) of water; (*b*) of using the impounded water for a 12,000 horse-power electric installation; and (*c*) for using its 20 cubic-metre (750 sec.-feet) discharge during summer for the irrigation of about 30,000 hectares (74,000 acres) of the plains round Oristano.

The dam is 55 metres (195 feet) high, and will impound, as already said, 350 million cubic metres (437 million cubic yards) of water at a cost, including electric plant and irrigating canals, of 25 million francs (1 million sterling). The State contributes a sum of 3 million francs (£12,000), and also 150,000 francs (£6,000) per year, during fifty years, on condition that the price of the irrigation water will not be more than 0.005 francs per cubic metre (¼d. per 1,000 gallons). At the lapse of sixty years all the works become the property of the State.

As already said, the water from all these artificial lakes is always used first for motive power in some of the hydro-electric installations, which in Northern Italy are very numerous. This greatly helps in lowering the price of irrigation water, which afterwards can be distributed by means of canals to the different farms at prices varying from about 0.005 to 0.01 francs per cubic metre (from ¼d. to ½d. per 1,000

* See Luiggi.—Dighe recentemente costrutte in Italia.—Giornale Genio Civile. Roma, 1914.

gallons), or at an "annual rate" of from 80 to 120 francs per hectare of land (£1 10s. to £2 10s. per acre per annum).

(F) *Water Derived from Rivers.*—These prices are quite acceptable in semi-arid regions, like Apulia, Calabria, Sicily, and Sardinia, where three or four irrigations during the period from 15th March to 15th May, when the plants are in full growth, may save the crops from total failure, and fully repay the expenditure on the water, and may later give another crop such as maize, potatoes, melons, &c. However, they are still too high for ordinary irrigation, especially of meadows, which form the most important feature of the plains of Lombardy and Piedmont. Besides, for very large extensions of land, the quantity of water

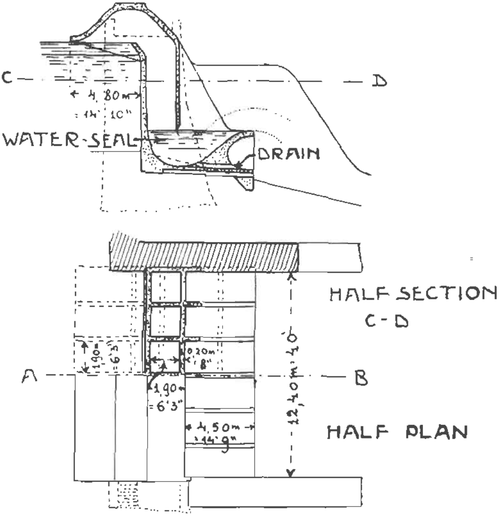


Fig. 5.—Automatic syphon for 3,150 cubic feet per second discharge.

that can be impounded in an artificial lake is always comparatively *rather small, from a few cubic metres per second to 20 cubic metres* per second (750 sec.-feet), as in the Tirso district, and 44 cubic metres per second (1,540 sec.-feet) in the Fortore Valley, which are, of course, quite exceptional cases.

So, when larger quantities are required, and at a very low price, then it is necessary to obtain the water from rivers, fed, if possible, by some natural lake, like the Rivers Ticino, Adda, Oglio, Mincio, whose waters are comparatively *warm*, or by *some glaciers*, which, *melting* in the summer season, act practically like lakes of frozen water, and in this

condition are the Rivers Tanaro, Po down to Turin, Dora, Sesia, Orco, Adige, and many others. These waters, however, being rather cold, are not so efficient as the waters from reservoirs or lakes.

In this case the engineering works, called "derivazioni," consist in general (*a*) of a weir or submerged dam of very substantial masonry, built across the river, and capable of raising the level of the water above that of the country to be irrigated; (*b*) of some controlling sluices at the canal head ("*edificio di presa*"), which may be as many as twenty, as, for instance, in the Villoresi Canal (Fig. 8); (*c*) of another group of sluices adjacent ("disarenatore"), arranged in such a way as to cause a strong current across the entrance of the canal, and thus scour away the solid matter that has a tendency to deposit in front of the main sluices and then creep into the canal. Then follows the main canal, with a

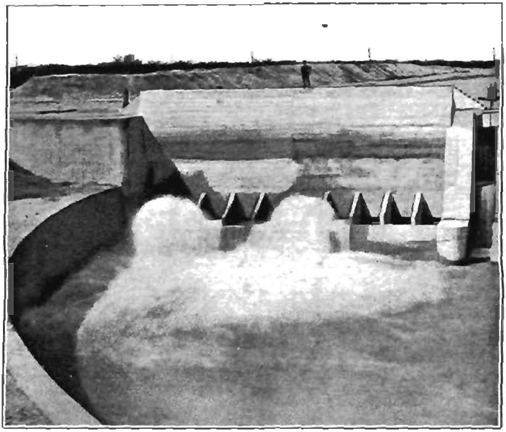


Fig. 6.—Automatic syphon spillway at San Giovanni Lupatoto (3,500 sec.-feet discharge, 20-feet head).

fall of 0.15 metres (6 inches) to 0.50 metres (1 ft. 8 in.) in 1,000 metres (3,280 feet), according to the shape of the canal and the volume of water, in order to keep the velocity at 0.50 metres (1 ft. 8 in.) per second at least—so as to prevent silting—and not to exceed 0.70 metres (2 ft. 8 in.) per second in ordinary cuttings, so as not to erode the banks, otherwise they must be heavily revetted. In aqueducts, inverted syphons and such constructions of masonry, the velocity is kept between 1.2 metres (4 feet) to 2 metres (6 ft. 6 in.) per second, and, in exceptional cases, even 3 metres (10 feet); but in this case the masonry must be laid in cement mortar.

The main canal is provided with the usual controlling works, such as overflows, and scouring outlets, and regulating weirs at the entrance of

the secondary canals. These latter have a fall from 1 to 2 metres per 1,000 metres, and feed the private or distributing ditches, which are provided at their intake with some means for measuring the water to be delivered. Generally a submerged orifice, or a "Cipolletti" weir, or some such over-fall "notch" is used, provided it gives an accuracy of 2 per cent. of the water measured.

No mechanical meters are adopted, except in very rare cases, and for very small deliveries.

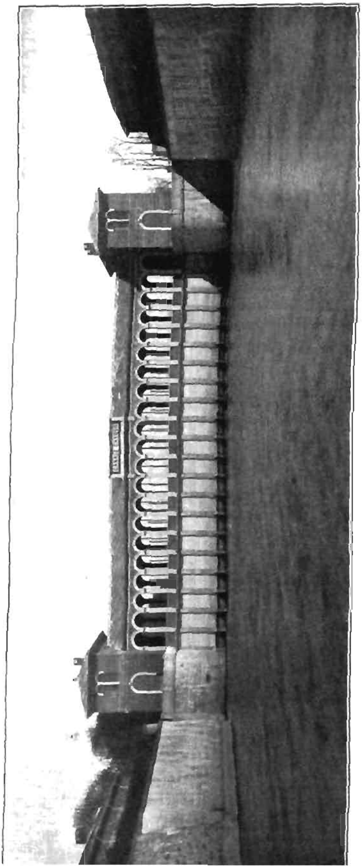
Many of these irrigation canals date back to the Middle Ages, and are also used for inland navigation—in fact, this is a feature of the Italian canals called "Navigli," to serve both for irrigation and navigation purposes. It was on these "navigli" that Leonardo da Vinci built the first locks to allow boats to pass from one reach of a canal to another at a higher or lower level.

The oldest is the "Naviglio Grande" of Milan, built in the 12th century; it is about 50 miles long, and has a discharge capacity of 65 cubic metres (2,275 cubic feet) per second. Next in order of date comes the "Muzza" from Adda, with 60 cubic metres (2,100 sec.-feet), then the "Naviglio of Cremona" from Oglio, with 30 cubic metres (1,050 sec.-feet), and many others, all about five to six centuries old, and several hundreds of smaller canals, ranging from 20 to 5 cubic metres per second (750 to 175 sec.-feet), down to thousands with a fraction of 1 cubic metre per second (35 sec.-feet).

The canals of modern times, that is, those built during the last fifty years, since Italy was united in one State, merit special attention. The largest and longest of all is the "Cavour" (Fig. 7), with a discharge capacity of 110 cubic metres per second (3,850 sec.-feet), a development of about 70 miles of main canals and about 950 miles of secondary canals and distributing ditches; that is, a total of over 1,000 miles! It was begun in 1855 by a private company that failed, and was bought over and finished in 1866 by the State at a cost of about 100 million francs (£4,000,000 sterling). This canal, still the most important in Europe, was the means of transforming an almost barren region of Piedmont of 250,000 acres of land and gravel—growing only stunted timber and bushes, that gave a gross revenue of 20 to 25 francs (8s. to 10s. per acre) per hectare per year—into the most fertile rice-fields and meadow land of Italy, where the best butter, parmesan and gorgonzola cheeses are produced, and where rents are from 200 to 300 francs per hectare (£3 to £5 per acre).

Then in degree of importance, and also from the point of view of their engineering features, follow the "Villoresi" canal (Fig. 8), with 44 cubic metres per second (1,450 sec.-feet); the "Marzano" (Fig. 9), with 30 cubic metres per second (1,050 sec.-feet); the "Veronese," with 15 cubic metres per second (525 sec.-feet); and the "Tagliamento," with 17.5 cubic metres per second (617 sec.-feet). They are all excellent models of their kind, both for the important hydraulic works along their courses and the perfection of their administration; so much so, that hydraulic engineers and agriculturists from all parts of the world come to visit and study them.

Another large canal is about to be started, called the "Emiliano," from Piacenza to Bologna and Rimini, 300 kilometres long, with 200 cubic metres per second (7,000 sec.-feet) capacity, at a cost of about 250 million francs (£10,000,000 sterling).



Scouring Sluices.

Intake Sluices.

Fig. 7.—" Cavour Canal " Headworks. Discharge 3,850 ***cubic feet per second.***

And a still larger canal is now in course of construction near Grosseto, in Central Italy, of 600 cubic metres per second (21,000 c.f. sec.), which will be in working order in 1915.* It will utilize the muddy waters of the river Ombrone (Fig. 10)—which in flood carries as much as 10 per cent. of solid matter—in order to silt up some large marshes and transform them into excellent arable land, as has been done on a large scale, and with very good results, both from a sanitary and agricultural point of view, round Ravenna, Grosseto, Caserta, and other provinces. When the level of the land, by this process of gradual silting up, has been raised some 2 or 3 feet above the natural water-plane of the district—or when the "colmata," as it is called, is complete then the head works and the canal will be slightly altered; that is, the sill will be raised in order to prevent too much silt coming in, and it will then be used both for irrigation and navigation.

This will probably be one of the largest canals in the world, as those derived from the Ganges and Euphrates carry only about one-third and three-fifths of the water of the Ombrone Canal, which will be surpassed only by the Ibrahimieh Canal, derived from the Nile, with about 900 cubic metres per second (31,500 sec.-feet) discharge capacity.

The water from the State canals is sold generally at 25 francs (£1) per 1 litre-second per year, which corresponds to a volume of about 30,000 cubic metres (1,050,000 cubic feet) per annum, discounting the time when the canals are dry for ordinary repairs. Thus the cost of the water comes to about 0.83 francs per 1,000 cubic metres. This "*one litre-second*" is what, in Northern Italy, is considered necessary for the irrigation of one hectare of land; it means a uniform stratum of water 10 feet high distributed all over the land during the twelve months. It also means an expenditure of about 8s. per acre per year. As, however, the irrigation is necessary only during the five to seven months of the dry season, so only one-half, or about 15,000 to 20,000 cubic metres of water, are really used; the rest is lost. Thus the cost of the water is actually from 1.66 to 1.02 francs per 1,000 cubic metres (4s. to 6s. per 1 million gallons); that is, on the average, only one-fifth of what it would cost if taken from the Tirso reservoir, which is the cheapest reservoir water in Italy, or from one-tenth to one-twentieth that of the water taken from ordinary tanks (*bacini a corona*), or artificial lakes or underground supplies (gallerie filtranti and fontanili).

When water can be had at such low rates, as from the State canals, or even at *double* this price, as from the Villoresi, Marzano, and other great canals belonging to private corporations, then irrigation amply repays all its cost, even for comparatively poor crops like grass, and pays better still for richer crops like rice, indian corn, tomatoes, melons, &c. Then farming becomes very profitable, and this explains the comparative wealth of the farmers of Northern Italy, who have practised irrigation from very ancient times, and are still extending it steadily to new districts.

It would be too long and tedious to describe, even rapidly, the very interesting and important engineering features of these canals, especially of the Villoresi and Marzano canals, which, being the latest, are the most perfect.† It would certainly be most interesting for engineers to

* Luiggi.—La derivazione dell' Ombrone di 600 c.m. per secondo.—Giornale Genio Civile Roma, 1914

† See Elwood Mead's report on Irrigation in Northern Italy.

examine their majestic headworks, the inverted syphons, and aqueduct that convey the water under or over the different streams and roads crossed by the canal, and all the smaller, but ingenious, artifices for the delivery and the best use of the water.

It will be sufficient to give the plans of some of the most typical works, for example, the head works of the "Farini" Canal, a feeder of the "Cavour," of 70 cubic metres per second (2,250 sec.-feet) capacity, the inverted syphon of masonry under the River Sesia, which discharges 110 cubic metres per second, and of the aqueduct over the River Dora; the inverted syphon of ferro-concrete under the Ombrone, of 600 cubic metres per second (21,000 sec.-feet); the aqueduct of the Marzano Canal over some other canals of 30 cubic metres, &c.

All these works can be easily inspected during a journey of two weeks between Turin, Milan, Cremona, Mantova, and Venice, and will amply repay any one interested in irrigation. Thus he will be able to see, not only the engineering features of the canals, but ascertain their beneficial effects. The land in those provinces was transformed, almost created, from barren, sandy, and gravel plains, into the most fertile vegetable soil by the silt gradually deposited by the irrigation water. Where,

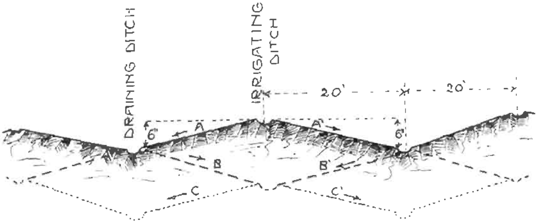


Fig. 11.—Diagram of cross section of super-irrigated meadow ("Marcita").

about fifty years ago, there was very poor agriculture and a miserable population, farming is now carried on with great success, and the country people enjoy a comparative comfort, and are content, at least as far as farmers can be.

They only clamour for more irrigation water, and complain when it rains out of season, because, contrary to the ordinary conditions of agriculture, when irrigation is adopted, the best crops are produced when there is constant sunshine, as in Egypt, where it never rains.

Thus Australia, like Italy, offers ideal conditions for successful irrigation.

III.—How the Water is Applied, and the Results.

Preparation of the Land to be Irrigated.—However, to apply irrigation with a certainty of success and get from the water and the soil the maximum benefit, it is necessary to prepare the surface of the land; that is, it must be properly levelled, or, better still, laid with a slight inclination from the irrigating ditches towards the drainage one, in order to prevent water-logging; then all the ditches have to be prepared, and the intercepting sluices put in place.

All this, in the best cases, costs 200 to 300 francs per hectare (£3 to £5 per acre), but where the natural ground is rather irregular, even 800-1,000 francs (£12 to £17 per acre) may be required.

In some cases, where the surface falls towards the north, it is even convenient to tilt it towards the south, with an inclination from 3 deg. to 5 deg., in order to get the full benefit of the sunshine. For this purpose the top layer of vegetable soil is stripped off and laid by, the subsoil arranged with the proper gradients, and then the top layer is re-deposited on the surface. And when a "marcita," or a super-irrigated meadow, is to be prepared, then the whole field is arranged in plots (Fig. 11 above), about 6 metres (20 feet) wide, 60 to 90 metres long (200-300 feet), with a lateral fall of 0.15 metres (6 inches), and sloping alternately almost like some flat roofs laid all alongside each other. On the top ridge of two adjacent plots runs the irrigating ditch; the water overflowing from this ditch runs slowly down the two slopes of each plot, and the surplus is collected by the draining ditch. This being slightly higher than the next plot, the run-off water can fall along to the next irrigating ditch, and overflow on two more sloping plots, and in this way all the water is fully utilized.

All this requires work and capital. In Northern Italy, where irrigation has been practised from time immemorial on a very large scale, the capital is easily obtained, and paid off in some 30-50 years; but in the South, where irrigation is still in its infancy, and capital is very scarce, the State comes to the aid of the farmer by lending the money at 2 to 2½ per cent., to be repaid in 40-50 years. The farmer, with the advice of some Government official appointed for this object, prepares and presents a plan of what he intends to do; this plan has to be approved; then the State lends out the capital in instalments as the work advances, and at the same time a mortgage is put on the land.

This arrangement works pretty well—especially in the Campagna Romana, which is being rapidly transformed from almost waste land—very thinly populated by poor nomadic peasants—into good corn land and meadow land, with proper farm buildings and a settled population. Now some parts of it can compare with the best districts of Lombardy, thanks also to the land being more fertile, owing to its volcanic origin, and to a larger amount of sunshine during the year.

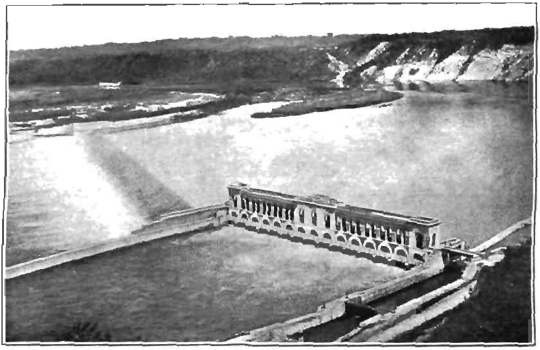
Thus irrigation begins to have a beneficial social influence round Rome, in a region of about 450,000 acres, which was considered almost beyond redemption, and where "malaric" fever reigned supreme.

Thanks to irrigation and cultivation on a proper scale, "malaria" is abating rapidly, and Rome will soon be surrounded again by beautiful fields, as it was in olden times, when sixty-four large villages, some with most luxurious villas, were flourishing in that region, and of which we find remains when the plough cuts again the long abandoned soil.

Quantity of Water and Economical Results Obtained from Irrigation.—It would be very interesting, but beyond the scope of this paper, to mention the ingenuity displayed for using the water to the best advantage in order to increase the production of special crops, such as oranges, fruit, early vegetables, and flowers for distilling purpose, accordingly only the production of the most usual crops such as grass and cereals—the staple branches of Italian agriculture—will be considered, also because they are the only ones that might interest Australian farmers.

Where the land can be super-irrigated, as in the "marcite," and the water coming from underground has an almost constant temperature of 55-60 deg. Fahr., irrigation can be practised even during the winter months; then some 20,000 to 25,000 cubic metres are required per hectare, at a cost of 25-50 francs per hectare (8s. to 16s. per acre). The water is applied in "rotations" every 15-20 days, at the rate of 1,000-800 cubic metres each hectare, corresponding to a stratum of water 10 to 8 centimetres high (about 4 inches to 3 inches) for each rotation.

The "marcita" can produce seven to eight cuttings of lucerne or trefoil grass per year, at the rate of, at least, 500-600 quintals* per hectare (400 to 500 cwt. per acre), and in the best marcita even 800-1,000 quintals (640 cwt. to 800 cwt. per acre), sufficient to feed two cows per hectare, which produce 26 to 30 quintals of milk† (10.4 cwt. to 12



Weir. Headworks.

Fig. 8.—"Villoresi Canal." Discharge, 2,450 cubic feet per second.

cwt. per acre). This is sold at 13-16 francs a quintal for dairy purposes, and gives a gross revenue of about 350-400 francs per hectare (£7 to £8 per acre), against an expenditure of 100-120 francs per hectare (£1 12s. to £1 19s. per acre) for water and labour, leaving a very good profit to the farmer.

In the usual irrigated meadows where water is applied at the rate of 15,000 cubic metres per hectare, corresponding to a stratum of 5 feet high, during the five-seven warm months the profit is smaller as the cuttings are only five to six, with a total weight of grass from 400 to 500 quintals per hectare (160 to 200 cwt. per acre). A good meadow not irrigated is rented at 150 to 200 francs a hectare (£3 to £4 per acre), but when it can be irrigated its rent is raised at least to 250-300 francs (£5 to £6 per acre), or almost double, whilst the expenditure is not much more.

* One quintal equals 100 kilogrammes, one-tenth of an English ton nearly.

† In large farms milk is always sold by weight; it is easier, and there is less danger of contamination.

In the Roman Campagna, where the land is less permeable than in Lombardy, the water necessary during the dry season for irrigated meadows varies only from 7,000 to 9,000 cubic metres per hectare (245,000 to 350,000 cubic feet per acre), and is applied at the rate of 500-600 cubic metres (17,500 to 21,000 cubic feet) every ten-twelve days. The rent paid by the farmer to the landlord for land near Rome varies from 100-150 francs per hectare (£1 12s. to £2 10s. per acre), but when irrigated the rent is just double, and even more. The most profitable cultivation is grass, as Rome consumes a large amount of milk, which can be sold by the farmer at 22-24 francs a quintal (18s. to 19s. 6d. per 21½ gallons—1 quintal—or about 10d.-11d. per gallon). Thus meadow land produces a very good rent, and irrigation is being applied rapidly in the district round Rome.

In the Southern provinces, especially in Apulia, where, owing to the peculiarities of the rainfall, cereals are cultivated on a large scale in preference to grass, the usual product in ordinary years is 8-10 quintals of wheat per hectare (6½ cwt. per acre). In very good years, when rain falls in the proportion of 180-200 mm. (7 inches to 8 inches) during the period in which the plants are in full growth—that is between 15th March and 15th May—then 16 to 18 quintals (13 cwt. to 16 cwt. per acre) of wheat are produced; but in dry years the product is only 4 to 5 (2 to 3 cwt. per acre), and in poor soil the crops may be lost completely.

With irrigation, even at the very low proportion of 2,000-2,500 cubic metres of water per hectare (28,000 to 35,000 cubic feet per acre), but applied in four rotations during the two months mentioned—when the wheat is in full development—a product of 16-18 quintals of wheat per hectare is assured every year, instead of the usual average one of 8-10 in land not irrigated. Thus, even paying for the water at the very high price of 0.03 to 0.04 francs per cubic metre (1¼d. to 1¾d. per 1,000 gallons)—as its cost is in Apulia, where water is scarce—that is, with an expenditure of 80 to 100 francs per hectare (£1 10s. to £2 per acre) a larger crop, valued at about 140-180 francs, is assured, leaving an average profit of 70 francs (about £1 5s. per acre). Thus irrigation not only repays amply for the water and guarantees always a good crop, but leaves also a fair surplus. It acts as an insurance against all climatic risks!

After the cereals have been gathered, some other plants of rapid growth, like tomatoes, water melons, cabbages, &c., are laid down, and well irrigated, and then, thanks to the abundance of sunshine, two crops can be gathered in one year.

This explains why the farmers of Apulia, Sicily, Sardinia clamour for irrigation, as they know by experience that water applied at the proper moment prevents the crops from the greatest calamity they dread—that is, lack of rain. By assuring the proper degree of moisture in the soil and in the necessary quantity for the different crops at the very moment when it can give the best results, a good harvest is always certain.

Instead of suffering from the fluctuations of the varying seasons, that is, one or two good years, with five or six middling ones, and then two or three bad, *the harvest is always good every year*, and occasionally it can also be very good, when the season has been especially favorable.

For the cultivation of Indian corn, potatoes, tomatoes, and the usual vegetables, the water required varies from 7,000-8,000 cubic metres per hectare (245,000 to 280,000 cubic feet per acre), applied in "rotations"

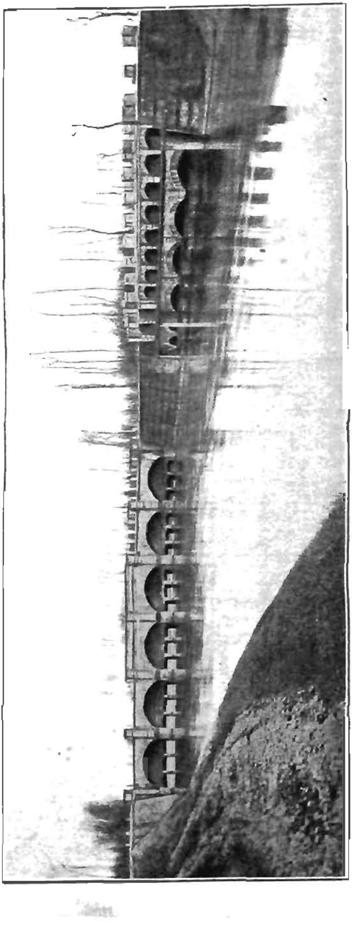


Fig. 9.—"Marzano Canal" syphon and aqueduct at Lagazzone with a discharge of 1,050 cubic feet per second.

every 10-12 days, at the rate of 400-500 cubic metres (14,000 to 18,000 cubic feet per acre) each time, and in all cases the cost of the water is even more amply repaid and the profit higher.

These examples, that may have a direct application to Australian agricultural conditions, are sufficient to give an idea of the quantity of water required for the cultivation of grass, cereals, and ordinary vegetables, and of the financial results. Besides, they prove the fact that *irrigation gives agriculture an almost certain revenue, putting it beyond* too great fluctuations, and completely avoiding the losses of bad years.

Thus, from the point of view of the farmer, irrigation is undoubtedly a great success.

Financial Aspect of Canal Construction.—Unfortunately the same cannot be said for the canal administration. Except for small irrigation plants—like "tanks" and "infiltration tunnels" made by private landowners—an irrigation canal pays only for working expenses, and leaves a very small margin, 1 to 2 per cent., for the capital invested, unless hydro-electric power can also be combined with irrigation.

The reason is that it is not sufficient to build a canal carrying a large volume of water to make it a success; it is necessary to be able to sell this water; that is to find the farmers ready to use it. But, as mentioned earlier, before the water can be disposed of the distributing ditches must be prepared, the land properly levelled; then the farmers must learn how to apply the water to the land, at the precise moment, and in the proportion most convenient for the growth of plants in each kind of soil; they must decide which crops are the most profitable in each district; and, furthermore—where the land is not very permeable—it is also necessary to prepare drainage ditches in order to get rid of the surplus water that otherwise, by stagnating, might damage the vegetaton or produce an excess of parasitic plants or cause water-logging of the land.

All this requires experience, time, and capital, and thus for many years the Canal Administration is not able to sell all its water. In the best cases it takes from twenty to thirty years—and sometimes even longer—to dispose of all the water of a very large canal.

The "Marzano" Canal, which crosses the Province of Cremona—where irrigation has been adopted since the Middle Ages, and all the distributing ditches were already in service when the main canal was built—in fact, its function is only to increase the flow of the old irrigation canals—required fully thirty years before all its 30 cubic metres per *second of water were disposed of, and yet the conditions were most* favorable. The "Villoresi," also in a region where irrigation is very well developed, and in use since the 12th century, has not yet disposed of all its water, after forty years of existence, and the financial conditions of its administration are far from being prosperous.

Necessity of National Aid for Irrigation Canals.—This is the reason why the Italian State helps all these undertakings. Irrigation puts under cultivation large tracts of land of very little value, or almost sterile, and part of the population that now emigrates can thus find profitable employment in the cultivation of this land, and so increases the national wealth.

Italy has an increase of population of almost 1,000,000 inhabitants per year, of which about 500,000 are obliged to emigrate; some 300,000 go to North America, 100,000 to Central Europe, while some 80,000 go to Argentina, and 20,000 to other countries or round the Mediterranean.

To moderate this exodus, which is not beneficial to the nation, the State encourages irrigation by granting a substantial subsidy, already mentioned, of 3 per cent. per year for a period of ten years, on the capital spent in the construction of the main canal and its principal branches, 2 per cent. per year for the following ten years, and 1 per cent. for another period of ten years. Then the subsidy ceases. But if the canal is arranged in such a way as to help also in the control of the flood waters—as when, for instance, impounding reservoirs are also built—then another subsidy is granted for this purpose, in the proportion of 10 per cent. to 30 per cent. of the capital expenditure. For instance, for the Tirso reservoir and canal, estimated at about 20 million francs (£800,000, excluding the hydro-electric plant), the State, besides the usual annual grants, pays 3 million francs more, because of the benefit derived from a better regulated discharge of the river, that prevents inundations in the low lands. It also grants another £6,000 per annum for fifty years as a help for the irrigation canal, so that the water can be sold at not more than 32 francs per hectare (11s. per acre) to the

Fig. 10.—"Ombrone Canal" headworks for intake of 21,000 cubic feet per second.

farmers. After sixty years all the hydraulic works become the property of the State.

On these lines the Canal Corporations can thus derive a fair benefit from their enterprise.

IV.—Conclusion.

The conclusion, based on Italian experience, is that irrigation prevents the risk most dreaded by the farmers; that is, a complete loss of the crops in years of drought. With irrigation, a crop sufficient to pay all expenses and leave a small profit is sure in all cases, even during the worst years. So irrigation is a sort of insurance against risks.

But then in normal years it affords a very substantial profit to the farmers who cultivate meadow lands, and this increase of profit is certain, even if only grass can be grown, provided that the water can be got at the rate of 25 to 30 francs per hectare per year (11s. to 17s. per acre); but where cereals can be cultivated, even with water at 70-100 francs per

hectare (£1 10s. to £2 per acre), there is still a good profit, besides the advantage of never completely losing a crop.

On the other hand, irrigation works on a large scale are not profitable to the Administration of the canals during, at least, the first thirty years; *thus these undertakings require great help from the State during this* trying period. But, then, the State, in the form of taxation, and in the increased wealth of its citizens, reaps from these works many benefits, financial and social, that repay amply all the sacrifices made for this purpose.

Without irrigation Italy would not be able to feed a large proportion of its present population, and the Northern Provinces would not enjoy their present progress; as it is, Italy, with her magnificent network of irrigating canals, has become the "Garden of Europe."

Now the State is busy preparing to extend irrigation to the Southern provinces in order to be able, in forty or fifty years, to feed a population nearly double the present one, or from 50 to 60 million inhabitants.

This can only be done by *scientific irrigation*, and this explains also *the reason why the Italian State encourages and helps by all possible* means, including financial grants, all undertakings directed for the better *regulation of its water resources.*

Conclusions.—The conclusions presented and approved by the Congress of the British Association, Section G, at Melbourne, were the following ones:—

1. Irrigation is decidedly most beneficial to the farmer, as—besides acting as an insurance against failure of crops in bad years—it generally doubles, or more than doubles, the normal crops, or enables the cultivation of crops of higher commercial value; it represents a very important progress for the district where it is applied; but it is not equally bene*ficial for the Corporations that carry out the irrigation works, which* generally take fifteen to twenty years, or more, to dispose of all the water, *and thus there is a dead loss during a period of twenty years, or even* more.

2. However, as the State—in the form of increased revenue from land taxes and, in fact, from all the hundred forms of revenue for the Exchequer—gets a large benefit from the irrigation lands, besides the social importance of closer settlement, it is only just that the State should either carry out these works at its own cost or, at least, grant financial help to encourage irrigation projects when properly arranged on scientific and financial bases; and that such projects should receive moral support from all the citizens, as they all, directly or indirectly, benefit from a better cultivated land, from an increased rural population, and from *a higher standard of life which prevails in irrigated districts.*

Bibliography on Irrigations in Italy.

I.—*Italian Authors.*

Bionda.—Le acque subalvee derivate da gallerie filtranti in provincia di Messina. Roma. 1908.

Bordiga.—Il valore delle acque per irrigazione—Atti dell' Istituto di Incoraggiamento di Napoli. 1906.

Cadolini.—Provvedimenti per promuovere le irrigazioni in Italia. Roma. 1906.

Campanella.—Sulla irrigazione dei terreni. Napoli, 1898.

Capitò.—Le acque delle Sicilia-Palermo. 1908.

Commissione Reale per le irrigazioni.—1 *parte*, Roma. 1911; 2 *parte*, Roma, 1913.

Inferrera.—Le derivazioni subalvee nel mezzogiorno. Catania, 1907.

Lombardini.—Le irrigazioni in Lombardia—Tipografia degli ingegneri. Milano. 1863 (non è recente ma è sempre classico).

Luiggi.—Dighe di scogliera per laghi artificiali destinati alle irrigazioni. Roma, 1913.

Luiggi.—L'evoluzione delle dighe per laghi artificiali. Roma, 1914.

Luiggi.—Irrigation Works in Italy. Melbourne, 1914.

Maganzini.—Il Canale Emiliano—Genio Civile. Roma, 1890.

Masoni.—Idraulica agricola. Napoli, 1889.

Mayer.—L'acqua per usi agricoli e industriali. Napoli, 1914.

Ministero Agricoltura.—Le irrigazioni in Piemonte. Roma, 1891.

Ministero Agricoltura.—Le irrigazioni nella Provincia di Bergamo. Roma, 1891.

Ministero Agricoltura.—Le irrigazioni nella Provincia di Mantova. Roma, 1897.

Ministero Agricoltura.—Le irrigazioni nella Provincia di Novara. Roma, 1895.

Ministero Agricoltura.—*Progetto del Canale Emiliano.* Roma, 1893.

Ministero Agricoltura.—Le irrigazioni nella Sicilia, Vol. 34. Roma, 1896.

Niccoli.—Ricerca ed usi agricoli delle acque. Firenze, 1904.

Raineri.—I serbatoi a corona. Piacenza, 1907.

Ruffolo.—Irrigazioni nel Tavoliere delle Puglie. Napoli, 1912.

Società Italiana per condotte d'acqua.—Brevi cenni sul canale Villoresi. Roma, 1885; id., 1888.

Soresi.—La marcita lombarda-Casale. Ottavi, 1911.

Torricelli.—Gallerie filtranti longitudinali. Annali Società Ingegneri. Parte IV. Roma, 1888.

Ziino.—L'irrigazione ed i suoi effetti nell' Italia meridionale. Roma, 1887.

II.—*Foreign Authors.*

(*a*) *English.*

Scott-Moncrieff.—Irrigations in Southern Europe. London, 1868.

Baird Smith.—Italian Irrigations. London, 1853.

Ismail Sirry Bey.—Irrigations in the Valley of the River Po, in Northern Italy. Cairo, 1902.

Elwood Mead.—Irrigation in Northern Italy. 1908.

(*b*) *French, Dutch, Etc.*

Nadault de Buffon.—Canaux d'irrigation de l'Italie Septentrionale. Paris, 1861.

Ronna.—Les irrigations. Paris, 1889.

Griuwis Plant.—Irrigation in Northern Italy (in Dutch). 1893.

A SHEARING SHED, SHEEP YARDS, AND DIP.

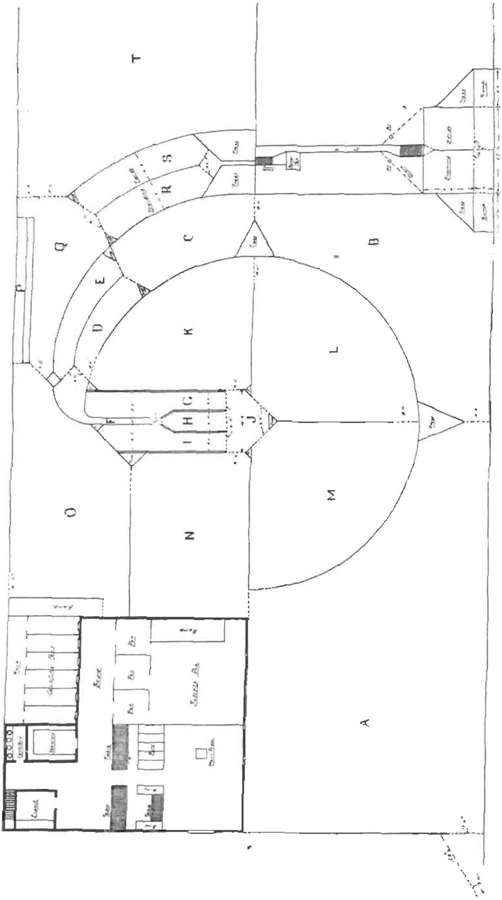
By J. S. McFadzean, Senior Dairy Supervisor.

Diversity of idea is a noticeable feature in connexion with sheep-yard construction. Very few yards will be found laid down on exactly similar lines, yet most of them are evidently the result of definite planning based on practical experience; and, as such, consequently give considerable satisfaction. It is a section of farm steading wherein locality and surroundings need to be taken carefully into consideration; and these, as well as the owner's experience, may easily give rise to changes in the arrangement of a plan which, on another farm, had been found almost perfect, and some such changes may, in the new situation, be necessary to at least maintain the original efficiency. The accompanying plan is a variation of that given in the *Stock Owners Guide*; and, in submitting it for the further information of those about to build, it is only claimed that on Mr. F. Charles Holden's farm, at Mount Cotteril, these yards have given complete satisfaction. (The shearing shed and dip are not yet built.)

In laying out the situation of the farm steading here, Mr. Holden had the advantage of several favorable sites from which to make his choice. When this estate was purchased some eighteen months ago there was no homestead on it and no subdivision. It lies about 4 miles to the south-west of Rockbank Station, on the Bacchus Marsh line; and three-quarters of a mile back from the road, and towards about the middle of the property, stands Mount Cotteril, the volcanic hill, 679 feet high, from which the estate takes its name. The red soil has considerable surface stone distributed over it; but most of this is in small to medium-sized boulders, which can be easily removed; and the land is thus possible of being prepared for cultivation at a comparatively low cost. The mount is flat-topped, showing clearly the site of the eruption by which the stone was distributed; and, on a point on its eastern edge, a cairn with flag-pole has been erected by the Defence Department, indicating the hill to be a landmark of some interest.

Though the land slopes gradually away from the mount in every direction, leaving ample choice of situation for building on, it is to one on the northern slope that preference has been given. Here the farm steading will have shelter from the colder south-westerly winds through the high land behind it; while the gentle slope allows of good catchment for dam water, as well as satisfactory drainage for the yards and buildings. This latter is a frequently overlooked, though most essential, feature in the lay-out of a farm, in order that the yards may be capable of stock being handled in them comfortably during the winter months if necessary; and the site of the stock-yards on Mount Cotteril is excellent in this respect.

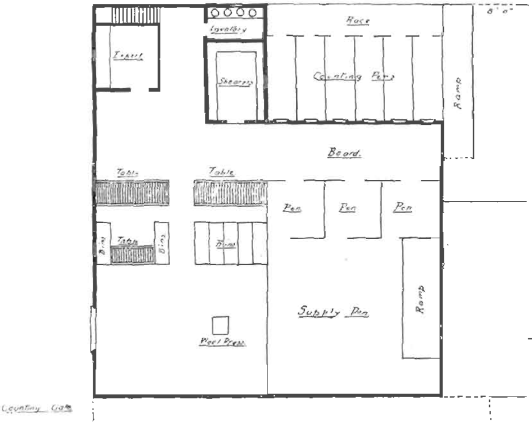
With the fall to the north-east the entrance to the sheep-yards is at the top corner. From these the sheep follow the circular fencing round to the right through the three yards marked A, B, and C, through the pair of "handling" yards D and E, and on to the race F. Here they may be drafted into any of the three pens G, H, and I; and from there may be passed on to the shearing-shed yards N and O, or to any of the other three yards K, L, and M through the "lobby" yard J.



Plan of shearing shed, sheep yards, and dip.

There is no doubt that the circular arrangement of the yards has a very definite advantage in working sheep; for with the gates open to them they will be found to run straight on and fill up the drafting race of themselves with never a stop.

The three gates, from G, H, and I into J, as well as the one between the race and H, are hung with pulley and weights on a 12-foot frame, by which they can be run up quickly out of the way, giving full room in these smaller yards, and allowing of the quick transfer of the drafted sheep to the adjoining yards as required. As usual, the sides of the race, as well as of the middle pen (H), are double-boarded, and the adjacent small pens (G and I) boarded on the inner side for the protection of the sheep while being drafted. The two drafting gates are of sheet-iron over tubular frames, and are very light running. The dual "handling" pens D and E allow of continuous drafting, even when handling, classing, raddling, &c., is being done; for, while this is going on in either yard, sheep from the other can be put through the race meanwhile if desired, and time thus saved.



Plan of shearing shed.

It is intended to build the wool-shed with the shearing floor high enough to allow of the ground floor to be utilized for "sweating pens" in which to hold woolly sheep overnight for next day's shearing. Entrance to these pens will be on the level from yard N; and below the battened flooring of the pens above these lower pens will be ceiled over with a sloping roof of tarred iron. From these sweating pens the sheep will pass up a ramp within the shed to the supply pen above, and on to

the catching pens. From the counting-out pens on the other side of the shed they pass through a race to a ramp running down the outside of the shed, out to the yard O below, and on to the branding race P. The double line shown here on the plan represents a second fence, within which the brander and his outfit may stand clear from the sheep in yard Q; and this fence also acts as a check against any strong sheep scrambling out of the race to the flock. From Q the sheep may be taken as required on to yards R, S, or T, or back through O and N to the entrance yard A.

A "count-out" gate is arranged in A to adjoin the side of the shearing shed. This is 2 ft. 6 in. wide by 4 feet high, with 8-inch rollers of hardwood on each side, which prevents jamming and bruising of the sheep in passing through; and also by allowing only two sheep to pass through at once the work of tallying is made much easier. It has been found that the sheep come out of this small gate very quickly but quietly, and without jumping in the gateway, as they will do in an open space, or even in a similar but wider passageway, such as a slip-panel with the top rail in. This "counting out" gate has a small gate to close over it from the outside when not in use. It will be observed from the plan that all corners have been cut out from the yards by reserving these spaces for the planting of shelter trees, a feature which will shortly add materially to the comfort of the yards, both for the stock and those working with them. The two-storied wool-shed will also shelter the yards; and, should a cold snap occur at shearing time, the protection of the shed will be of much benefit to shorn sheep while standing in the yards there.

The arrangement of the wool-shed and dip do not call for much explanation, as their lay-out may be easily followed from the plan. It will, however, be noticed from the width of the "board" that allowance has been made for machines; also that the comfort of both classer and shearers has not been overlooked in regard to dressing-rooms, &c.

Directly to the west and above these yards lie the farm buildings; while the homestead, surrounded by orchard and garden grounds, is to be built in front of these latter, and to the north-west of the shearing-shed. A good supply of underground water has been struck at a point lower down on the farm by boring to a depth of 150 feet. One of the two proposed dams is in course of construction, and the large extent of roofing on the farm buildings already erected gives a good catchment for rain-water. All the buildings already up have their roofing on the same level, which arrangement is to be maintained with the rest of the steading as built. The object of this is that by linking all the tanks up together by iron piping from below, as already has been done with those in position, the water may be kept at the same level in all. By this means excess water will not escape from any tank until all are full, and all are being drawn on to the same extent always from any tap on the circuit.

Another item worth noting at this stage of the fitting-out of this farm is that of the fencing. In all the subdivisional fences the corner posts and strainers are of concrete, while the stays, intermediate posts, and droppers are of angle iron. These carry seven plain wires and a barb on top; and, with the tubular iron and woven wire gates, the fence has a particularly light and neat appearance, yet is exceptionally strong and practically indestructible.

At present the stock on Mount Cotteril consists of some 850 comeback ewes lambing to Border Leicester rams; about 50 dry sheep, and a few head of store cattle. Later on it is intended to establish a stud of Border Leicesters, a line which offers prospects of good financial returns, for not only is this locality noted for its good carrying capacity and early growth of grass, but its soundness as sheep country is proverbial.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

(Continued from Page 442.)

Part XIV.—Co-operation in the Distribution and Marketing of Fruits.

By E. Meeking, Senior Fruit Inspector.

ESSENTIALS FOR SUCCESS IN AGRICULTURAL CO-OPERATION.

In many other countries besides those mentioned in the preceding articles agricultural co-operation has been successfully applied, but a detailed description of these is unnecessary for the purpose of these articles. Wherever the co-operative principle has been adopted, the following would appear to be the chief essentials for success:—

1. Thorough preliminary organization by the selection of the more intelligent growers in each district as organizers.
2. Large subscribed capital.
3. Wide distribution of shares.
4. Good management.
5. Business-like rules.
6. Loyalty from shareholders.
7. Clauses in articles of association to penalize disloyal shareholders.
8. The establishment of central packing houses in each district.
9. Packing near point of production.
10. Selling, when possible, near point of production.
11. The introduction of cool storage accommodation and ice-car transport.
12. The formation of (*a*) district associations; (*b*) central distributing exchanges.
13. Incorporation of district associations with central distributing exchanges.
14. Dividends to shareholders never to be above the current bank rate of interest.
15. The selling of fruits in standardized grades; such grades to be always typical of quality.
16. Fruits, whenever possible, to be handled in large lots.

Space will not suffice for detailed explanations as to why the policy outlined above is the best to adopt in order to secure success, but taking the details *seriatim*, the necessity for their adoption may be briefly summarised thus:—

1. Thorough preliminary organization is mainly necessary for educational purposes.

2. Large subscribed capital is required to enable associations to tide over possible initial losses, and to expand their policy in any direction when such may be found necessary and desirable.

3. Wide distribution of shares would tend to gather as many fruit-growers into the concern as possible.

4. The necessity for good management is too obvious to need explanation.

5. *Business-like rules.* It is meant to indicate by this that the clauses in the constitution dealing with the managerial and financial sides of the association should be as elastic as is possible in conformity with efficient protection of shareholders' interests.

6. Loyalty from shareholders. This principle should be observed both in spirit and letter as it is the key-note of success in co-operation. In its truest sense, it means, amongst other things, (*a*) the sinking, when necessary, of personal interests and prejudices; (*b*) the refusal to be tempted by prices higher than market rates, and which may be temporarily offered by outside buyers to wean members from the association.

7. For the purposes of discipline, clauses to penalize disloyal shareholders are usually inserted in large co-operative societies which embrace many members.

8. *Central packing houses* have chiefly proved valuable as a means of concentrating the work of packing, and of providing facilities for the work beyond the means of the individual grower. This saves the cost of labour, materials, &c., and, in addition, provides for the employment of trained and skilled packers, and for the packing of fruit in accordance with fixed standards.

9. Packing near point of production would, of necessity, follow the establishment of the central packing house in each district.

10. The practice of selling at the point of production is carried out to a large extent in Canada, where big lines are sold by the associations to the buyers for the local British and European markets.

11. *Cool storage* has been found necessary for successfully transporting and marketing fruits. The need for its wide establishment in this State has been advocated in the columns of this *Journal* so often that further recapitulation is unnecessary. These foregoing remarks apply with equal force to the establishment of ice-car transport. The value of pre-cooling fruits prior to shipment received practical proof in connexion with the shipment of pears during the past three seasons. The results have shown that, provided fruits are pre-cooled as soon as possible after being picked, and are maintained throughout transit at low temperatures, they may be successfully transported to any part of the world.

12. District associations, in addition to a central distributing exchange, are necessary for purposes of regulating supplies in accordance with demands. The functions of the district associations is to prepare

the fruits for market and forward these to the central exchange in such quantities as that body may advise. The business of the central exchange is to keep in touch with all markets, and to place the fruit forwarded by the district associations on the best market obtainable.

13. The incorporation of district associations with each other, and the further incorporation of these with the central exchanges has been found the most satisfactory basis on which to work. This plan would certainly confer greater financial stability on the association.

14. The fixing of dividends at not more than the current bank rates of interest seems a sound financial proposition, and one likely to prevent the non-fruit-growing shareholder from benefiting at the expense of the fruit-growing shareholder.

15. Provided that grade marks are a true indication of the contents of packages, the selling of fruits in grades is the most honest, rational, profitable, and expeditious manner of disposing of fruits. As proof of this, it may be mentioned that some prominent fruit-growers in this State, who for many years have graded and truly marked their fruits, have established so good a reputation that buyers order fruits packed by their growers without previous examination.

16. Large lots of fruits can be handled and sold with proportionately less expense than can small lots.

Briefly, the establishment of the central packing house system, the formation of district associations, the careful grading of fruits, the selling of fruits on grade marks, the adoption of the co-operative principle in its fullest and widest sense, the thorough loyalty of members, and sound business-like management, would appear to be the main factors which have made for successful co-operation amongst fruit-growers in all countries where co-operation in the fruit-growing industry is flourishing.

The Success Achieved in Other Countries should be Possible of Attainment in Victoria.

There does not appear to be any reason why the splendid results achieved in the United States, Canada, and elsewhere should be impossible of attainment in this State. Our State is relatively better supplied with railways than say either California or Ontario, the province where co-operative societies are in so flourishing a condition. The railway mileage per ratio of area and population of the three places is as follows:—

—	Area. Square Miles.	Per Mile of Line Opened.	
		Population.	Area in Square Miles.
Victoria	87,884	373	23·7
California	158,360	302	20·08
Ontario	260,860	295	30·5

The above figures show that in the matter of rail transport facilities fruit-growers in this State possess advantages over the fruit-growers of Ontario and California. The relative proximity of all parts of

Victoria to the sea-board is an advantage not possessed by the grower in either of the American provinces, where the average distances between the orchard and the ship's side far exceed those of this State. The railways in this State moreover are not under the control of private monopolies as in the United States of America, where they have in some instances used this control to the detriment of co-operative associations.

Why is Co-operation not Popular amongst the Fruit-growers of Victoria?

So far co-operation has not been extensively applied amongst the fruit-growers of this State. Although something like 39 co-operative societies exist in Victoria, only two of these which deal exclusively with *the fruit industry are at present in existence.* These two, however, although operating in rather a small way, are in a flourishing condition, and might with judicious management form the nucleus for more extensive operations than they at present carry out. The reason that co-operation is not popular amongst the fruit-growers of Victoria is, perhaps, hard to explain, but it may be attributed to the general prosperity of the average fruit-grower. During the past few years the demand for fruit in the local, Inter-State, and oversea markets has been in excess of the supply, and as a consequence returns resulting from the high prices have possibly satisfied the fruit-grower with present arrangements.

Necessity the Parent of Co-operation.

If this be so, fruit-growers would do well to remember, however, that this state of affairs may not continue, and that the time may come when *the necessity for eliminating all unnecessary expenditure in connexion* with his occupation will be forced upon the fruit-grower. Regarding this aspect of the question the remarks of Mr. G. Harold Powell, General Manager of the Californian Fruit-growers' Exchange, an authority who has been quoted before in these articles, should be of interest—

"The point of view of the farmer is being gradually readjusted by scientific education and experience, and in time he will unite with his neighbours to bring about better farming, better business methods, and a richer country life. Then it will be possible to inaugurate a new order of industrial agriculture, and a new race of farmers will grow up like those who are settling in the foothills and valleys of the newer western states. Intelligent co-operation among farmers may accomplish all of these things, and make for progress in a community such as no unorganized agricultural industry can foster. But successful co-operation develops through a gradual evolution, the mainspring of which, at least in its childhood, must be grim necessity. If it is born prematurely, it starts with a weak constitution and expires in the first encounter with adversity. It must be formed by farmers who realize that agriculture is passing through a slow evolution in its adjustment to modern, social, and economic changes, and that the business of the farmer must be handled collectively rather than individually if the farmer is to share equitably in the increasing prosperity which the better organization of all kinds of industry has brought to the country."

CONCLUSION.

These articles have attempted to point out that the necessity of organization for mutual benefit exists amongst the fruit-growers in this State. It has been shown that a huge amount of unnecessary waste in material and effort is constantly taking place, and also that our methods of harvesting, packing, transportation and distribution are faulty in many material respects, in the local, Inter-State, and oversea trade alike. The establishment of co-operative organization, aided in certain directions by Government supervision and assistance, seems to the writer to provide the only permanent remedy. The reader is left to decide whether this is so, and also as to the feasibility or otherwise of carrying this opinion into effect.

TANNING BARK.

LEATHER PRODUCTION.

The High Commissioner of the Commonwealth (Sir Geo. Reid) recently requested, through the Hon. the Prime Minister, that the Victorian Government should supply exhibits of tanning bark, skins, and leather for display throughout Great Britain, and also asked to be furnished with information as to the source of production, annual output, and prices of the samples. Accordingly the samples have been collected by the Senior Inspector of Farm Products (Mr. Robilliard), and the Agricultural Superintendent (Mr. A. E. V. Richardson, M.A., B.Sc.) has supplied the following information:—

Source of Production.—The supply of tanning bark is obtained from naturally occurring Acacia trees in the Victorian forests. The best bark is grown towards the west of Victoria, and it becomes less valuable towards the east, *i.e.*, towards Gippsland. The least variation of value, according to locality, appears to be shown by the Golden Wattle, wherever it is grown. Very good bark comes from the district within a 35-40 miles radius of Portland. Good bark is also obtained from the districts around the Grampians.

Trees can be stripped at six-seven years of age; the death of the tree naturally following.

The production of bark in Victoria is not keeping pace with the demand owing to the extension of cultivation and grazing. Acacias can be artificially grown on the poorer soils, giving remunerative returns. The plants have several natural enemies, particularly woolly blight, borers, and "fire blight," which quickly damage a plantation, and need to be suppressed.

The Forestry Department of Victoria has 20,000 acres of natural wattle plantation, which are of considerable economic value.

The question of costs and profits in bark production depends to some extent upon the vicinity to markets where large tanneries are established. In addition, the cost of hand-stripping is £2-£2 5s.

Price.—The price of wattle bark is now £6 5s. to £8 per ton, according to quality.

Output.—The annual output of bark is 11,363 tons, and this is all used locally. In addition, there is a small quantity of bark imported from South Africa, due to the local supply not keeping pace with the demand.

SKINS AND LEATHERS.

Source of Production.—Until recent years the production of tanneries in Australia was confined to the coarser class of leathers, but lately the tanning of finer skins has been undertaken with satisfactory results. The position of the tanning industry in Victoria is shown as follows:—

Number of factories	55
„ employés	1,548
Actual horse-power of engines employed ..	1,471
Approximate value of land and buildings ..	£174,735
„ „ plant and machinery ..	£118,649
Total amount of wages paid during year ..	£168,567
Value of fuel used	£10,935
Value of raw material worked	£1,059,941
Total value of output	£1,371,741
Value added in process of manufacture	£311,800

THE ANNUAL OUTPUT.

Raw Materials Used: -

Hides and skins	986,000
Pelts treated	636,000
Bark used	11,363 tons.

Value of Leather Produced:—

16,469,000 lbs. = £1,317,000

Basils:—

645,000 lbs. = £23,850

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Bee Expert.

(Continued from page 476.)

XXVI.—THE HONEY FLORA OF VICTORIA.

Three factors govern success in bee culture, namely, locality, management, and the right strain of bees. Of these three, the first named is the most important, for, without a suitable locality, the best of management and the best strain of bees cannot produce good results, while, even with poor management and an inferior strain of bees, fairly good results are sometimes obtained in good honey districts.

A good locality for bees means to have within range of the flight of the bees sufficient honey and pollen producing plants of the right kind. It is a question of quality of flora rather than quantity. For

the beginner, it is by no means easy to select a locality suitable for bee-keeping, as the relative merits of the various Eucalypts and of other honey-producing plants are as yet little known, and have, so far, not been dealt with, from the apiarist's point of view, in any publication. The information available is the result of the observations of bee-keepers in different parts of Victoria made in recent years, and, as many of the Eucalypts pass under different names in different districts, and nectar production is influenced by climatic influences and other causes, absolute accuracy and completeness is not possible. Of some of the Eucalypts nothing is known as to the amount and character of honey obtained from them by the bees, but they are enumerated and illustrated to facilitate identification of others.

In the difficult attempt to describe the various species of Eucalypts in a way which will enable the reader to distinguish one from another by means of the illustrations, the technical terms which occur in the botanical works upon which the descriptions are based will, as far as possible, be avoided. For the sake of brevity, and to avoid repetition, it will, however, be convenient to use at least a few of these terms such as: umbel (a cluster of buds, flowers, or seeds on one central stalk), marginal vein (the vein running parallel with the edge of the leaf), &c. For identification, the reader is invited to rely mainly on a comparison of the shape and veins of the leaves, the shape and number in one umbel of the bud and flowers, and the appearance of the sucker leaves (where shown). The illustrations are reproduced from *Forest Flora of New South Wales*, by kind permission of Mr. J. H. Maiden, Government Botanist of New South Wales, and from F. von Mueller's *Eucalypts of Australia*.

The information, which will be given, as to the character of the honey from different Eucalypts, the time of blossoming, length of time in bud, pollen or not pollen producing, and the order in which the trees are given as honey producers is based upon material supplied by a number of apiarists and on the writer's own observations.

The Yellow Box-Tree (*Eucalyptus melliodora*).

Fig. 1.

The Yellow Box or honey-scented Eucalypt is undoubtedly the most valuable nectar-yielding tree of Victoria. It is a middle-sized tree, but attains exceptionally a height of 200 feet and a stem diameter of 8 feet at the base. The bark is outside brownish-grey, inside yellowish; it covers the greater part and sometimes the entire stem of the tree. There is, however, great variation in the appearance of the trunk and also the branches of individual trees. In some specimens the rough bark covers only a few feet of the stem near the ground, the rest being smooth and giving the tree at first sight the appearance of a White Gum, while other trees sometimes growing near by have the entire stem and the branches covered with rough bark, thus resembling somewhat the Black Box of the Mallee, or, when the bark is of a greyish tinge, the Peppermint. Yellow Box does not, however, grow in the same localities, Black Box being confined to drier and Peppermint to moister districts. A comparison of the three shows that the leaves of the Yellow Box are broader than those of the other two, and the veins are differently placed, particularly the marginal vein. Also in the Peppermint the number of flowers carried in one umbel is much larger.

The branches of the Yellow Box are mostly, but not always, smooth, often drooping; the branchlets are mostly very slender. The leaves are narrow, not very long, mostly of a dull-green on both sides. The small flowers are from 4 to 7 (seldom 3 or 8) in an umbel. Seen from a distance the foliage often has a decidedly blueish tinge in comparison with other Eucalypts growing near it. The wood is yellowish in colour, very

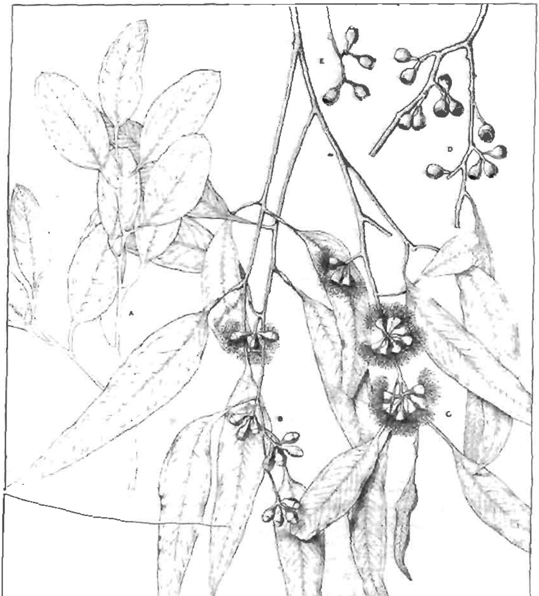


Fig. 1.—The Yellow Box (*Eucalyptus melliodora*, A. Cunn.).

tough and hard when dry. It is used for spokes, naves, cogs, rollers, sleepers, and telegraph poles.

The Yellow Box is widely distributed over Victoria, but is rarely found where the average annual rainfall is over 30 or under 15 inches, and rarely ascends to high elevations. In the western part of the State it grows usually in company with, or at no great distance from, Red

Gum, Yellow Gum, and Stringy Bark, while in the Central, Northern, and Eastern districts it is also associated with Grey Box and Red Box. It blossoms every second year from November till February. Generally speaking, it flowers to the west of the longitude of Melbourne one year, and to the east of it the following season. There are, however, exceptions, certain areas in the western blossoming the same year as the trees in the eastern half, and, as might be expected, there is some irregularity on the imaginary dividing line.

Nothing definite is yet known as to why nearly all the Yellow Box trees in a district blossom the same year. It is suggested, however, that as blossom buds appear on new growths only, and no new wood is made by the trees in a drought year, it follows that all trees would thus be brought into the flowering stage in the same year.

The buds of the Yellow Box become visible ten to twelve months before flowering, which occurs during November, December, January, and February. As with many other Eucalypts, there are some trees which blossom out of season.

Yellow Box honey is perhaps the best liked and best known of our Victorian honeys. When quite free from other honeys (which it seldom is), it is of a pale, straw colour, very dense, aromatic, with a pronounced flavour. It keeps liquid almost indefinitely when free from Red Gum honey. So far as is known, bees do not collect pollen from Yellow Box blossom. Pollen which by some apiarists was credited to this source was by means of the microscope proved of different origin (wattle or grass tree). Where pollen-yielding plants are absent during the Yellow Box honey flow, the worker force of the colonies of bees generally diminishes owing to restricted reproduction, and queen bees raised during this period are of little value.

The River Red Gum (*Eucalyptus rostrata*).

Fig. 2.

This is one of the best known and most valuable of our timber trees, and so characteristic in general appearance that it is easily distinguished from other Eucalypts. It sometimes grows in company with Manna Gum, and there is some resemblance in the colour and texture of the bark of the stem of the latter to individual trees of the former, but a comparison of the two will show a difference in the shape of the buds and in their grouping.

The Red Gum grows along river banks and watercourses or in alluvial valleys. It often attains a height of over 100 feet; under particularly favorable circumstances up to 200 feet. The trunk is proportionately stout, a diameter of 14 feet being on record. The bark is smooth, ashen-grey, or whitish. The leaves are slightly sickle shaped, and of the same colour on both sides. The flowers are usually in umbels of 4 to 14, the buds are pointed, the fruit roundish.

The wood, which is of a dark reddish-brown, is very durable, especially underground, and is extensively used for building timber, railway sleepers, and many other purposes.

The Red Gum tree blossoms every second year, usually the same year as Yellow Box, and concurrently with it, December and January being the principal months. It is in bud for eleven to twelve months. The bloom does not last long on a tree, and there is not much variation in

time between different trees. The blooming period is therefore comparatively short, but the secretion of nectar often very profuse; it is in fact one of the heaviest yielders. It also produces pollen in great quantities, and is therefore exceedingly valuable in Yellow Box country, as the pollen not only keeps the bees going in brood rearing, but also enables them to lay in a good store for a time of scarcity, which not infrequently follows.

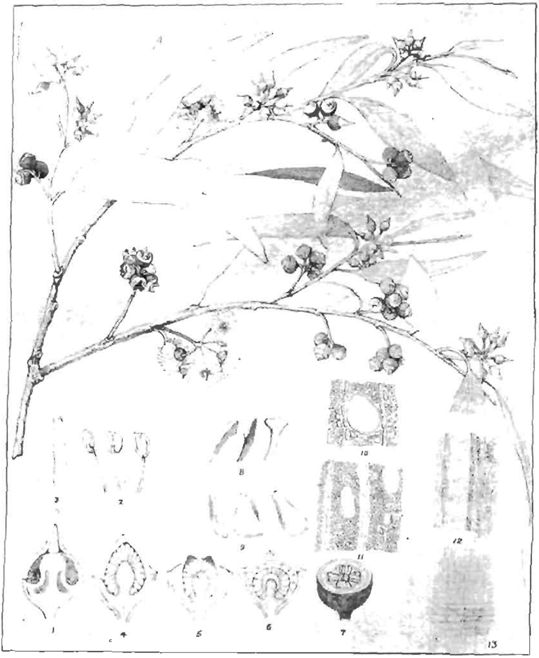


Fig. 2.—**Red Gum (Eucalyptus rostrata, Schleck).**

The honey is of a clear golden colour, not quite so dense as that from Yellow Box, less aromatic, but of a milder and very good flavour; it candies quickly, and sets very hard when from trees in the Grampians country, but is less inclined to granulate when from trees on the Murray.

THE FOREST RED GUM (*Eucalyptus tereticornis*).

Fig. 3.

This, the Red Gum of East Gippsland, also passes as Flooded Gum, Grey Gum, and even Bastard Box tree. It differs from the River Red Gum chiefly in its more upright habit, the narrower and longer leaves, and the rather variable and more oblong shape of the buds occurring in individual trees. It is so closely allied to the one previously

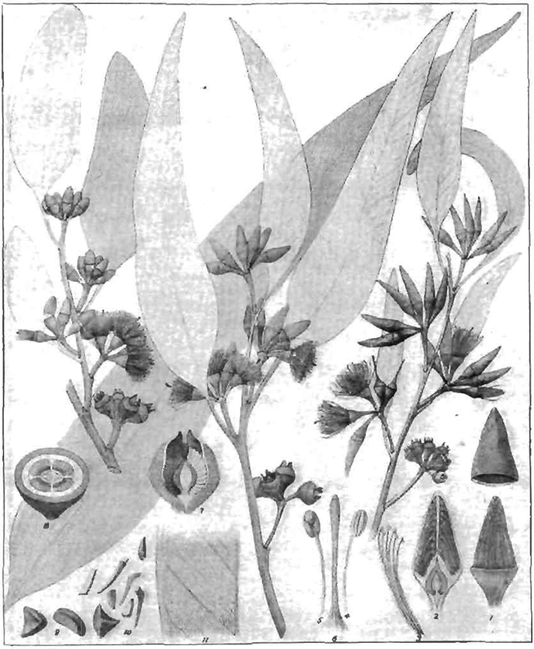


Fig. 3.—The Forest Red Gum (Eucalyptus tereticornis, Smith).

described that both might be regarded as forms of one species, and what has been said concerning the timber value of the River Red Gum also applies here. As to the value of this tree to the beekeeper, the character of the honey, the time and frequency of flowering, no reliable information is at my disposal.

YELLOW GUM (*Eucalyptus leucoxylon*).

Fig. 4.

This tree is known by many different names, and recognised as white ironbark by few people. In South Australia and part of Victoria it is called Blue Gum, elsewhere White and Smooth Ironbark, White Gum, Gum, and White Box. It occurs in many parts of Victoria, near the

Fig. 4.—Yellow Gum or White Ironbark (Eucalyptus leucoxylon, F. von. M.).

Grampians, often in company with Red Gum, Yellow Box, and Stringy Bark. In the Mallee it is often found near Black Box, but on drier ground elsewhere it is also associated with Red Ironbark, Grey Box, and Long-leaved Box.

Usually it is a moderate-sized tree, but attains occasionally a height of 120 feet. The bark is smooth, greyish-white, usually with a greenish-yellow tinge, more noticeable when seen from a distance. The leaves are narrow, slightly sickle shaped, greyish, or dull-green on both sides, the marginal vein distinctly removed from the edge of the leaf. The flowers, usually 3, sometimes 4 to 5, rarely 6 to 11 in an umbel, are white, pale-yellow, and rarely pink in colour, the buds are conical in shape. The flowers and fruits are sometimes considerably larger than those shown in the illustration (Fig. 4), but occasionally even smaller. The wood is pale to reddish-brown, of great hardness, durability, and strength. It is used for railway sleepers, poles, shafts, slabs, cogs, &c.

This tree is a fairly regular bloomer and heavy yielder of nectar, but no pollen is gathered from it by bees. It blossoms, generally speaking, during the winter months; near the Grampians it commences in May and June, ends in December; in drier and gold-bearing country it continues from April till November. In the Mallee it flowers in September, October, and November. The buds appear from six to ten months before. It blossoms more or less every year, but heavier every alternate season. A peculiar feature of this tree is that sometimes it secretes nectar which the bees will not collect, although honey-eating birds freely avail themselves of it Till quite recently it was assumed that, owing to the humidity and low temperature of the atmosphere at the time of blooming, the nectar was too thin and watery to attract bees.

Some later observations proved that the same neglect occurred to the nectar of the Red Ironbark when it blossomed during dry warm weather (February), and an excess of moisture was quite unlikely In all the instances, however, both in summer and winter, there was an entire absence of pollen, and it is just possible that the bees, unable to produce the nitrogenous secretion which converts the nectar into honey, refrained from gathering the nectar.

The honey from Yellow Gum is of the finest quality, of pale-straw colour, dense when properly ripe, clearer and milder in flavour than Yellow Box honey.

The Red Ironbark (*Eucalyptus sideroxylon*).

Fig. 5.

The Red Ironbark, also known as Rough and Black Ironbark, grows chiefly on ironstone ridges and gravelly rises. It is not a very tall tree, but sometimes attains to 5 feet in diameter at the base, usually upright in habit, but drooping in the outer branches of old trees, the large handsome flowers resembling fuchsias from a distance. The bark, which varies from dark-grey and brown to black, is deeply furrowed on old trees, very hard, and of great thickness. Leaves, flowers buds, and fruits are almost identical with those of the Yellow Gum, but are usually somewhat larger. The flowers are white, occasionally pink. In most localities it blossoms between June and September. In the Inglewood and Tarnagulla districts, however, it appears to flower in February. It is in bud from five to six months. No pollen is gathered from the blossom. The honey is of fine quality, much like that of Yellow Gum, but no great yields of it appear to

be harvested, partly perhaps because it blooms in winter, and partly because it does not occur in great numbers together.

The wood, which is red in colour, tough, hard, and strong, is one of the most durable and valuable of the hard woods. It is largely used for railway sleepers, telegraph poles, piles, waggon work, &c. While in leaf, flower, and fruit, the Red Ironbark closely resembles the

Fig. 5.—The Red Ironbark (Eucalyptus sideroxylon, A. Cunn.).

Yellow Gum; it differs from it considerably in general appearance, the bark, and the colour of the wood. In the seedling and sucker leaves the two are quite distinct, as will be seen on reference to the illustration (Fig. 5). B and C represent seedling and sucker of the Red Ironbark, and G, H, and K the same of the Yellow Gum.

(To be continued.)

AGRICULTURAL CO-OPERATION IN AUSTRALIA.

By P. J. Carroll, Senior Inspector, Dairy Produce.

(Continued from page 482.)

Federalizing the Co-operative Associations for Purpose of Distribution of Produce.

A movement was begun about the middle of the year 1900 amongst a number of co-operative butter factories to form a central association, the head-quarters of which were to be in the city. The objects of this association were to receive and dispose of the produce of the factories, and undertake all the duties previously carried out by private agents.

This was the first purely co-operative distributing company in Australia.

At the time operations were commenced the paid-up capital of the company (The Victorian Butter Factories Co-operative Company Limited) was £1,490. It is claimed that enormous savings have been effected in the cost of marketing the produce, and that the shareholders are enabled to obtain legitimate prices for their output. One substantial saving, however, resulted in the reduction of the agents' commission by 1 per cent. The company made considerable progress, and at the end of six years extended its functions to the manufacture of butter-boxes and the business of freezing. The wisdom of the latter step was always regarded as questionable, seeing that the Government had previously entered into the work of freezing, handling and exporting perishable goods on a practically co-operative basis—that is to say, the Government did not lay itself out to make any profit on the undertaking. This company has now a paid-up capital of £8,000, and a reserve fund of £4,500, and £17,000 has been invested in freezing works and box factory. The turnover of the company since its inception has been £4,500,000, and the profits earned £38,250.

About 1904 an impetus was given to the further extension of the principle of federating the co-operative butter factory companies by some disclosures made before a Royal Commission on the Butter Trade, which had sat some time previously. The Western District Factories' Co-operative Produce Company Limited, which embraced most of the butter factories in the Western District of the State, was brought into existence. The chief objects for which the company was established are stated in the memorandum of association as follows:—"To buy, sell, export, and distribute all kinds of dairy produce, bacon, poultry, eggs, honey, and any farm, dairy, and garden produce; to purchase, manufacture, and sell all farm and dairy requisites, including implements and machinery.

The shares shall be allotted to and held only by butter, cheese, or bacon companies."

The original issue of shares was 900 at £55 each, and the sum of £1,690 was paid up in money.

The turnover of the company since 1904 amounts to £5,344,972. The profit is, approximately, £50,000, of which £12,500 has been expended in an extensive butter-box factory, where the whole of the boxes required for this group of butter factories is manufactured.

There still remained a considerable area of the State, in the south-eastern portion, known as Gippsland, which had not embraced the system of co-operative marketing. In 1905, however, a company consisting of thirty co-operative butter factories was formed for the purpose of dealing with the distribution of the output from these factories principally. The business of this company at its inception was confined to the sale of butter, cheese, eggs, and bacon. After five years' experience it was decided to extend the sphere of operations to all kinds of farm produce.

The original capital of the company, like its predecessors, was on a very limited scale, and for the first three years the sum of £867 represented the full amount paid up. Since that time, however, the capital has been increased to £21,000, and individual agriculturists and dairy farmers have been admitted as shareholders. During the eight years of this company's existence the total sales have amounted to £3,757,000, resulting in a profit of £31,500. The sum of £25,000 has been paid in bonuses to producers, £1,655 in dividends, and £3,000 stands at reserve. In conjunction with this company there is also a large factory for the manufacture of butter boxes.

Victorian farmers are becoming more critical regarding the methods of the middleman, and are realizing the value of organization for their own protection.

That the principle of co-operation is sound is fully emphasized in the illustrations already quoted. In the manufacturing and preparation of produce, and to raise the standard of such produce, the combined effort, if wisely directed, is *par excellence*. When applied to the purchase of stores and requirements for the farm and household, it should prove economical, but the ideal form of co-operation is the one that embraces both producers and consumers.

Co-operative marketing and distributing societies, if not carefully managed and controlled, have a tendency to develop into profit-earning institutions, and thus become ordinary trading concerns. The idea should not be to make or hoard profits or accumulate capital, for this leads to extravagance and speculation. Rather should the management be actuated with the primary and simple idea of combining resources for the economical disposal and purchase of produce, and to educate its members in the best methods of producing, manufacturing, and preparing their products for market.

Further Development.

Farmers in various districts of the State are further organizing for the purpose of making savings in the cost of distribution of other products, such as potatoes, onions, cereals, hay, chaff, &c., and for the purchase of bran, pollard, seeds, &c. The first and most successful of those associations was started in the district of Koroit, which is, in addition to dairying, a large potato and grain-growing district. This society is called the Koroit and Tower Hill Farmers' Co-operative Society Limited. The objects set forth are:—"The purchase and sale of farm and dairy produce, and the exportation and disposition of same, &c., &c." Under rule 10, the profits of the society, which it may be from time to time determined to distribute, shall be applied in the first place to payment of a dividend not exceeding £5 per centum interest to shareholders on paid-up capital, and the remainder, if any, shall be applied as follows:—25 per

cent. to be placed to a reserve fund, and 75 per cent. to be distributed by way of bonus to shareholders in proportion to business done with the society by such shareholders."

"The capital requisite to take over the premises and plant for the conduct of the business shall be raised by the issue of £1 shares; 2s. 6d. shall be paid on allotment, and the balance in monthly instalments of 1s. per share; but the directors reserve the right to make half-yearly special calls in addition, not exceeding 2s. 6d. per share. No member shall hold less than three shares, or more than 200 shares."

The capital of the company is £1,200, consisting of 1,200 £1 shares.

The directors signed joint and several guarantees to the bank in order to obtain the money necessary for the purchase of buildings and plant. There are 260 shareholders, 80 per cent. of whom are directly engaged in farming pursuits. The whole of the business is transacted from the head offices, and there are no branches or sub-agencies. Produce is sold direct to merchants and consumers in the cities of the various States, without the intervention of the middleman, and the basis of all sales is the Government grade certificate of quality. Every effort is made by the manager, assisted by the board of directors, to build up a high standard of quality, and by so doing to establish a reputation for reliability that will prove a valuable asset to the producers concerned. The utmost confidence is reposed in the management, and the farmers are realizing the benefits and savings resulting from their combined action. During the five years that this society has been in existence the total turnover has amounted to £132,100, and the profits earned were £3,146. Similar societies are in operation in various parts of the State, and many more are in course of formation.

The Principle of Co-operation amongst those Engaged in Fruit-growing.

The fruit-growers around Bendigo formed themselves into a co-operative society about the year 1901. At that time large quantities of fruit grown in this district had to be sold to jam-makers at very low prices. It occurred to the growers that it would be to their advantage to convert the raw material into the manufactured article, and thus retain the manufacturers' profit for themselves. The extensive and well-equipped factory of the Bendigo Fruit-growers Co-operative Association is the result of that decision. The society commenced operations in 1901, with a capital of under £1,000. The first year's transactions amounted to £5,353, and last year's sales exceeded £30,000. The original buildings and plant cost £834, and the plant and buildings to-day, after being heavily written down each year, stand at £7,600. The capital of the company is £14,000, with a reserve found, built out of profits, of £2,483. The total sales of products since the inception of the company represent £200,000, and the net profit on this amount was £13,712. The sum of £27,058 has been paid in wages and interest on capital, and £5,834 returned in dividends ranging from 5 to 10 per cent. on the paid-up capital.

About two years ago the Victorian Orchardists' Co-operative Association Limited was formed and incorporated under the Provident Societies Acts. The objects set out in the prospectus are similar to those previously referred to. In addition, however, it undertakes to teach

orchardists the proper methods of grading, packing, and marking fruits for market. The Association has now completed its second year, and the following information is supplied in the last directors' annual report:—"During the year goods to the value of £41,515 have been sold, resulting in a profit of £331." It is proposed to apportion this profit as follows:—

1. A dividend of 6d. per share per member.
2. A bonus of 1 per cent. to buyers on supplies purchased by them during the year.
3. A further allocation of £100 to reserve, making a total of £200.
4. The balance to be carried forward to next year's accounts.

In 1912 the number of cases dealt with by the Association was 11,000, and for 1913 nearly 30,000, thus showing the growing faith of the producers in the co-operative movement.

The board of directors is composed of orchardists actually engaged in the occupation of fruit-growing, and the Association consists solely of orchardists. It is the intention of the board of directors, as soon as finances permit, to enter into the business of supplying implements and other requirements to shareholders, and by being in a position to control the distribution of the whole of these goods to effect considerable savings to the producers. The standardization of fruits offered for sale is an important feature of their efforts, and it is proposed to carry this out so effectively as to be in a position to offer guarantees to the purchasing public, and to make the Association's brand a symbol of quantity and quality.

The grading, improving, and standardizing of products are amongst the most important functions that could be undertaken by these co-opervative Associations, and if their efforts went no further than this, the results would more than justify their formation. I regret to say that this phase of co-operation is too often subordinated to the commercial side of the business, and instead of encouraging the production of superior quality, the reverse is the case. The pooling of prices is one of the enemies of co-operation, and the practice is one which, if persisted in, will bring ruin on the particular organizations indulging therein, as well as inflicting untold injury on the industry itself.

What is meant by the pooling of prices is the practice of returning uniform prices for varying qualities and grades of produce. This practice, it is regrettable to state, is prevalent amongst co-operative distributing associations. As previously stated, and admitted by all writers on the subject, the primary object of co-operation is to educate the producers and assist them to raise the standard of quality of their produce.

The practice referred to, not being conducive to this end, is not a sound economic principle.

The Pig Industry.

Pig raising, which is a valuable adjunct to dairying, has, for the reasons hereinafter given, been subject to serious fluctuations in price, the periods of high and low values coming in cycles.

The operations of large private companies who were the sole manufacturers of bacon, and therefore the principal purchasers, were credited with manipulating prices to such an extent, when the supplies were large, that the values ruling left no margin for the producer. Prices as low as 2d. per lb. for pork on its feet were not uncommon. Young and store

pigs, as well as brood sows, could be had for the taking away, and it was not an unusual thing for the farmer to destroy whole litters of pigs rather than rear them at the ruinous prices offering.

It can be readily understood that under such conditions the breeding of pigs was, if not discontinued altogether, considerably curtailed, until prices again reached a payable level. The suspension of breeding generally led to scarcity of pigs, and prices would then become abnormally high, sometimes attaining to 8d. per lb. live weight. A revival in breeding usually followed this increase until the former stage was again reached. This see-saw condition of affairs proved very discouraging to growers, and precluded the possibility of an export trade in bacon ever becoming an established fact. It may have been the object of the curers above referred to to prevent this, as it is well known that an export outlet for any class of produce generally increases the competition, and results in higher and more uniform prices being maintained.

Being already conversant with the large export trade in Denmark of bacon to the United Kingdom, and of the unlimited market existing there for that class of produce, the State endeavoured to induce growers and curers to divert some of their surplus into the export trade. Although the farmers were quite agreeable to this course, the curers could not be prevailed upon to give the matter any practical support, and as a repetition of the past experiences seemed inevitable, the question of establishing a co-operative bacon factory was mooted. Before referring to these co-operative concerns, it might be interesting to quote a few figures showing the state of the pig-raising industry in Australia prior to that date:—

In 1860 the total number of pigs in the Commonwealth was	351,096
„ 1870	543,388
„ 1880	815,776
„ 1890	891,138
„ 1900	950,349

Up to the year last mentioned, a fairly regular increase in the number of pigs had been maintained. The year 1905 showed a further increase, the total number being 1,014,977. From that time a gradual decline became perceptible, and in 1908 the number of pigs (645,691) was lower than in any previous year since 1870. In the year 1911 (the latest for which records are available), the number of pigs in Australia reached the maximum, viz., 1,110,721.

Those very marked fluctuations in numbers are entirely due to the unsatisfactory market conditions previously referred to, and it was with a view to rectifying the anomaly, and placing the pig industry on a permanent and satisfactory basis that the present co-operative institutions were established.

Several previous unsuccessful attempts were made in the manufacture of bacon by co-operative companies. In many cases failure was accounted for by the want of experienced management and the determined opposition of the private firms and companies. These firms were in a position to pay higher prices to the farmer for the pigs, for the reason that they had built up large fighting funds at times when pigs were in excess of local requirements and prices low. The co-operative companies were invariably operating on small capital, and were unable to stand the strain of this severe competition. These failures gave the

private bacon curers more confidence in their strength, and they became more aggressive.

The North Coast Co-operative Company of Byron Bay, in the State of New South Wales, which was established for the manufacture of butter, was the pioneer in co-operative bacon curing, and added to its already extensive plant the necessary equipment for the manufacture of bacon. The operations are recorded as being immensely successful, and this enterprising company has already established an export trade in bacon. Dairying and bacon curing being sister industries, and carried on by practically the same people, it was appropriate that the businesses should be combined.

The Darling Downs Co-operative Bacon Company in the State of Queensland furnished another illustration of successful co-operation. In the last half-yearly balance-sheet the directors reported that during that period 8,208 pigs had been treated, and the sum of £19,398 paid to producers. The net profit, after writing off £496 for depreciation, was £1,617. It was recommended that the sum of £1,000 be transferred to reserve account, and a balance of £630 carried forward.

The chairman of directors, in addressing the shareholders, said they had every reason to be satisfied with the position and prospects of the company. The price paid for pigs during the half-year had been higher than was ever paid before in Queensland. There might be various reasons for that, but one of the strongest was the erection of their own co-operative company.

Pig-growers in Victoria grew tired of the manipulation of the market, and a movement was set on foot to establish one large co-operative bacon factory in the State. The movement fell through, fortunately, as such an institution would have proved too unwieldy for effective working, and the factory would have been too remote from many districts of the State where pig rearing had reached fairly large dimensions.

The south-eastern portion of the State was then organized, and a company established with an authorized capital of £50,000. This company has not met with the success that one would have anticipated. The reason given is the want of sufficient capital. It is evident, however, that there was either too little capital or that too much expenditure was incurred in the plant and equipment.

A later, and what promises to be a successful, company is the Western and Murray Districts Co-operative Bacon Curing Company Limited. This company embraces the western and northern portions of the State, and almost every farmer in that wide area is a shareholder. The authorized capital is £100,000 in £1 shares, and 39,600 have been subscribed by 4,000 farmers.

The company was successful in securing the services of an English expert as manager, and the results up to date are proving eminently satisfactory.

The building, which comprises engine-room, killing and hanging room, chilling and freezing chambers, curing cellars, drying rooms, smoke stoves, lard and sausage rooms, offal house, piggeries, &c., was erected under the personal supervision of the manager, and the capacity of the works is 1,500 weekly. The company purchased the whole of the materials, and contracts were let for labor only in erecting. By this means the complete factory was obtained for fully £12,000 less than the

estimated cost submitted by one of the leading architects of Melbourne. The building, land, and plant cost £30,000.

Under the co-operative system, the development of the pig-raising industry should be enormous, and Australia's contribution of bacon and pig products to the United Kingdom should rival in value its exports of butter.

STATE AIDS TO CO-OPERATION.

The only legislative enactment relating to the control of co-operative societies in this State is embodied in the *Provident Societies Act* 1890.

Clause 3 of this Act prescribes that any number of persons, not being less than five, may establish a society under this Act for the purpose of carrying on any labour, trade, or handicraft, whether wholesale or retail, and for applying the profits for any purpose allowed by any laws now or hereafter in force relating to friendly societies or otherwise permitted by law. It is further provided that the society must not lend or advance money to any of its employés or persons engaged in the management of the associated society. After laying down certain restrictions regarding investment of the society's funds, the Act stipulates that no money invested as share capital is to be withdrawn without at least six months' notice.

The provisions under this Act for those persons desirous of enjoying the advantages offered by co-operation were wisely framed. Unfortunately, however, the evasion of the Act was so readily accomplished that very few indeed of our co-operative trading and manufacturing associations registered under it. Compliance with the law was obtained by registering the society under the Companies Act, which contained fewer restrictions bearing on the conduct of the business.

As the partners in a farmers' co-operative society are, in the majority of cases, without experience in business and law, and not as competent to interpret their numerous ramifications as persons who usually band themselves together in large cities to carry on commercial undertakings, it is desirable that some sort of limitation should be placed on the actions of the more enterprising officers and directors. In the December issue of the *Monthly Bulletin of Economic and Social Intelligence*, Herr Gennes, the new manager of the National Federation in Germany, in describing the want of success of certain co-operative societies, remarked, in connexion with the failure of the local Loan and Savings Bank, that "they went wrong from the start in regard to the management of the business, for they did not observe the first fundamental rule to which rural loan and savings banks must conform, of contenting themselves with a restricted field of action."

Further comments by the same authority provide interesting reading indeed, and would, no doubt, be profitable to members of co-operative associations in this State who may be called upon to sanction further extensions of power and increases of capital in their own associations.

It is essential for the protection of their members that the working sphere of co-operative societies should be confined within certain prescribed limits, and legislation should be enacted to define those limits.

This action is all the more necessary on account of the financial assistance rendered by the State for the purpose of promoting agricultural development.

At the inception of the factory system of butter-making, a fillip was given to the industry by various grants of money for the purposes of educating the producer and promoting the export trade in butter.

The Minister of Agriculture at that time (the Hon. J. L. Dow), as well as providing a sum for the technical education of the producer, persuaded the State to make a grant of £30,000 as bonuses for the erection of butter factories and creameries. The sum of £500 was donated towards the building of central factories, and £300 for branch creameries. In order to foster the export trade in butter, a further sum of £103,000 was allotted on the basis of 3d. per lb. on all butter exported. This rate was subsequently reduced, and the payments made on a differential scale, *i.e.*, 1½d. per lb. on all butters realizing 1s. per lb. and over, and 1d. for butter realizing less than 1s. and over 10d. per lb. The State continues to take a very active interest in the progress of agriculture, by means of inspection and instruction by qualified experts. With a view to further conserving the interests of producers, the State entered into a lease for the use of an extensive cool store in the city, thus providing a check on the possible operations of owners of private stores in the direction of forming a combination to the detriment of producers. Considerable opposition was raised to the Government entering upon an undertaking of this nature. Notwithstanding this, however, producers evidently realized that it was to their advantage to support these stores, for the result has been that the management have found it impossible to meet all the demands for space. During the last three seasons the whole of the butter and cheese exported to the United Kingdom from the State passed through these Government stores. Some idea of the magnitude of the business transacted may be gathered from the fact that over £2,500,000 worth of perishable produce was examined at and shipped from the stores during the past season (1913-14). So beneficial has this enterprise proved to the producers of the State that Parliament was asked for, and sanctioned, an expenditure of over £70,000 for the erection of new and modern stores, with a storage capacity of over 300,000 cubic feet.

These stores will be worked on a basis which will give producers the maximum of benefit for the minimum of cost. All clients are equitably treated, and the absence of any incentive to manipulate business safeguards the interests of the small as well as the large producer.

Fruit Cool Stores.

Another direction in which the State assisted producing communities in their initial struggles was apropos of the fruit industry. The position, from a financial stand-point of many of the fruit-growers, was precarious, and State assistance was sought and granted. A cool store was erected in the centre of one of the largest fruit-growing districts, to enable small growers to reap the advantages of cold storing. It was expected that this illustration would have led to the rapid spread of co-operation amongst growers. The latter, however, although fully seized of the value of the facilities placed at their disposal, preferred the arrangement already alluded to, and the demands of the growers for continuous action in the above indicated direction were so insistent that, not only was this particular store trebled in size, but four other stores for similar purposes have since been erected by the State, with a total

holding capacity of 170,000 bushel cases. The success of this undertaking is complete, and the fact that the farmers are not obliged to find the capital makes the success of the industry so certain that a large development is assured. As a result of the evidence adduced by this action on the part of the State, additional stores have since been erected, and are being worked on co-operative lines. For fear of conveying the impression that the State was pauperizing these growers, it must be understood that there are certain obligations which require to be fulfilled. The growers, in proportion to their acreage, must give a bond that they will be prepared to make good any deficiency in the working of these establishments after labour and other charges have been provided for. Those other charges consist of the following:—3½ per cent. per annum on capital cost of land, building, and plant; 7½ per cent. per annum depreciation on machinery; and 2½ per cent. depreciation on buildings. A charge of 1½d. per case has been found ample to cover the whole of the costs, so that the growers get the advantage of effective storage at the lowest possible cost, whilst the State recoups itself for all legitimate outlay without any cost to the taxpayers. This scheme provides to the growers all the benefits of the co-operative system, plus the advantage of not being called upon to find the initial capital required for the plant and buildings.

Consumers reap considerable benefits in addition from the fact that a regular supply of fruit is maintained, and prices are on a more uniform basis.

The State has, in many other directions, assisted farmers by direct advances for the purchase of land, and by the expenditure of large sums of money in the construction of water storages for irrigation purposes. All the States of the Commonwealth have established systems under which financial aid is rendered to agriculturists by the Government. Acts have also been passed authorizing the Government to re-purchase alienated lands for the purpose of cutting them up into blocks of suitable size, and throwing them open to settlement on easy terms and conditions. The area of private land acquired in the Commonwealth for this purpose for the six years ended 1912 was something near 12,000,000 acres.

In Victoria, the Closer Settlement Acts 1904 and 1909 are administered by a Board intrusted with power to purchase suitable lands voluntarily or compulsorily, and to dispose of such lands on conditional purchase leases, either as (*a*) farm allotments not exceeding £2,500 in value; (*b*) workmen's homes, not exceeding £100 in value; or (*c*) agricultural labourers' allotments, not exceeding £200 in value.

For conditional purchase leases, payment must be made at the rate of 4½ per cent. for interest, and the balance in sixty-three half-yearly payments. Power is given to the Board to make advances up to £250 to settlers for the purpose of effecting improvements, which advances are repayable by instalments extending over any period up to twenty years.

Irrigation schemes constructed by the States run into many millions of pounds sterling. The State has adopted the policy of purchasing large areas of land commanded by these schemes, and subdividing them for intensive cultivation, and the settlement of those areas will mean a large increase in population. The management and supervision of these irrigation enterprises have been vested in a body consisting of three Commissioners, and recently the control of irrigable lands has been transferred to this body.

These manifold activities of the States, which are truly co-operative in character, supply the capital for the purchase of land, stock, and irrigation facilities. In other countries this becomes part of the functions of the Co-operative Banks or Credit Societies. Under such conditions, however, the initial capital must come from the settler himself, consequently he is impoverished to that extent, and not so well equipped to fight the battle which has to be undertaken before success can be achieved. The system in Australia is, therefore, in advance of that in other countries, and, by force of example, is fostering and promoting the true co-operative spirit. The progress of agriculture under such encouraging and healthy conditions is fully assured, and that the industry is going ahead by leaps and bounds is adequately attested by the following cogent facts:—

Production of butter in 1907 ..	..	156,380,670 lbs.
" " 1911 ..	..	211,577,745 "
Increase, 35.33 per cent.		
Production of cheese in 1907 ..	..	13,383,563 lbs.
" " 1911	..	15,886,712 "
Increase, 18.70 per cent.		
Production of condensed milk, 1907	..	9,643,551 lbs.
" " " 1911	..	22,983,707 "
Increase, 138.34 per cent.		
Production of bacon in 1907 ..	..	40,719,181 lbs.
" " 1911	..	52,261,652 "
Increase, 28.32 per cent.		
Production of wheat in 1906-07	..	66,421,359 bushels.
" " 1910-11	..	95,111,983 "
Increase, 43.19 per cent.		

These are but a few of the principal products.

Under the fostering care of the State, aided by the wisdom of the people, a salubrious climate, abundance of water, and magnificent soil, Australia should become one of the leading agricultural countries for its size in the world. The only obstacle at present to the realization of this ambitious title is the lack of rural population.

RADIO-ACTIVE WATER AT FERTILISER

Experiments to ascertain the influence of radio-active waters, both natural and artificial, on vegetation, have been carried out by J. *Stoklasa and Vdobnicky.*

Various units of radio-activity were applied at various times to growing crops.

With lentils, peas and wheat the radio-active water increased the yield from 62 to 164 per cent.

When the radio-activity was largely increased the growth of the plants was checked.

Large doses of radio-active emanations retard growth, and appear to give rise to toxic products.

Extract from "Fertilisers."

23rd May, 1914.

The effect of radio-active minerals upon plant growth has been receiving the attention of agricultural scientists for years past.

THE WALNUT.

(Juglans regia).

(Continued from page 461.)

By C. F. Cole, Orchard Supervisor.

Soil.

A fairly heavy, rich, deep loam, with a good subsoil, having adequate moisture and thoroughly drained, is the most suitable for walnut culture.

Any shallow soil, with stiff clayey or a too compact or impervious subsoil, is unsuitable, and should be avoided.

Deep, light, or sandy soils are not suited. The walnut will thrive upon light soils for some years if plentifully supplied with moisture, but the trees are either short-lived or become debilitated and unproductive. When selecting a site for walnut-growing, the physical conditions of the soil is of more importance than the chemical composition.

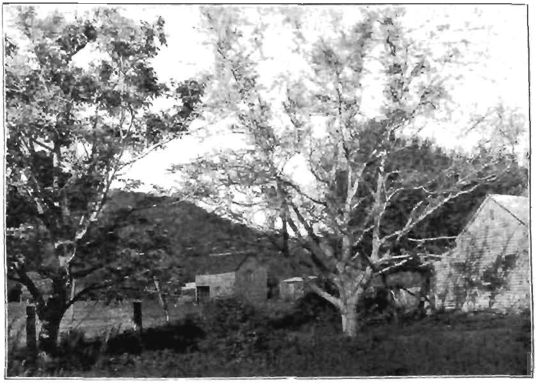


Fig. 6.—Walnut trees dying from excessive moisture.

Owing to the walnut being naturally a deep-rooting tree, the subsoil is of far greater importance than the surface soil—a strong or heavy free subsoil through which the water can percolate readily is best.

Deep, moist loams, such as are found in the gullies of mountainous districts, are best adapted to the walnut, the chief reason being mainly due to climatic, not soil conditions.

Undoubtedly the walnut, by careful selection of varieties, could be grown to advantage, and less liable to bacterial disease, in many parts of our warm, low-lying districts, where soil conditions are suitable, and water available. Many fine specimens of trees are to be seen thriving in

such districts. At Gehrig Brothers' vineyard, Barnawartha, several fine examples are growing without irrigation. Although these trees usually suffer from the want of moisture during the dry months of the year, they crop fairly heavily. If they were judiciously supplied with water they would bear much larger crops.

Some people are under the impression that to grow the walnut successfully it is necessary to have a permanent water-level 8 to 10 feet below the surface of the soil. This is a mistake, but the water-level should never come within less than the above distances from the surface. During the writer's investigations it was found that all the finest examples of trees were growing either upon hillsides or high ground, not less than 25 to 30 feet above the water-level.

Any subsoil that contains too great a quantity of moisture, or surface soils that are impervious or inclined to be so, and hold water for any length of time, are very unfavorable to the English walnut worked on its own roots, and the trees will not long withstand such conditions. In America they claim to have overcome these conditions somewhat by propagating upon root stocks best adapted to excessive soil moisture.

Illustration (6) depicts walnut trees at Bright, about twenty-five years of age, dying from excessive moisture. The trees are growing upon high land, well drained, under natural conditions, the soil being of a deep decomposed sandstone and slate formation. The trees were healthy and flourishing until water from a newly-made race began to percolate continually through the subsoil. This, combined with the superfluous water from the house flowing over the uncultivated surface soil beneath the trees water-logging it, caused the trouble. To attempt to grow walnuts upon any but the most suitable soils is hazardous, and will only result in failure.

Preparation of Land.

If the selected site requires clearing of timber, the method adopted should be by using a forest devil, traction engine, or even bullocks, to pull down the trees. Hand grubbing is too slow and laborious. After the cable or cables have been securely attached to the tree to be pulled down, the surface roots should be cut through if necessary. In many instances only those surface roots upon the back or opposite side of the tree from that in which it is being felled require cutting. Native green timber and dead timber on soils most suited to the walnut is usually easily pulled down.

In localities where the timber burns freely, the dry stumps probably can be stoved out. This is done by packing sufficient dry wood around the stump to make a good fire; then take a spade or shovel and cover the wood with turf completely, leaving an opening upon both sides of the stump to create a draught. When the fire is burning freely these openings should also be covered with turf. Constant visits should be paid to the stumps to see that the fire has not burnt through, and to add fresh turf, if necessary, to any openings. The success of stoving is largely due to keeping the fire confined. After the top of the stump burns off the whole should be covered with turf so as to keep the fire going, which will, in the course of a few days, burn the roots clean out to a convenient depth for ploughing. The hole made by the burnt out stumps should be cleared of ashes, and any roots unburnt or not deep enough from the surface should be grubbed to the required depth.

about 18 inches, the hole being refilled with soil. Great care should be exercised in seeing that all roots, &c., are gathered up and burnt; as from these the deadly fungus disease, Root Rot (*Armillaria mellea*), if present, will spread to the roots of the young walnut trees and cause loss. If there are any suitable trees upon the site they should be used for splitting posts for fencing purposes. Before planting, the whole area should be enclosed with a rabbit-proof fence, care being exercised in seeing that the slanting supports at the straining posts are placed inside, not outside, of the fence. If placed upon the outside, rabbits and other vermin can readily run up and enter the enclosure and do considerable damage by barking the young trees. Before planting the whole area should be carefully gone over to see that no rabbits are within the enclosure. The whole area should be ploughed to a depth of 12 inches in the spring, and allowed to lie in fallow in the rough until the autumn rains, when the soil should be well broken down with a disc roller, ploughed 18 inches deep, and prepared for planting.

If the clearing is finished in the summer or early autumn, the whole area for planting should be measured off and pegs placed along the headlands indicating where the rows of trees will be when planted; then strips of land about 10 feet wide should be ploughed about 10 inches deep, throwing the soil outwards and leaving the last furrow down the middle of the strip, which furrow should be the direct line of trees when planted. The freshly turned soil should be allowed to remain in the rough for some weeks when it should be well broken down, ploughed to the required depth, throwing the soil inwards to the middle furrow. Harrow down and peg off the area for planting.

The unploughed soil between the planted rows should be broken up before or in the spring to the same depth as the planted strips, and allowed to lie in the rough until the autumn. One advantage in adopting strip planting is that a planting season is not lost where the clearing was not finished until the autumn, and one is unable to plough the whole area. This applies more to large areas than small ones. The soil upon each side of the young trees should be kept well stirred during the dry seasons to conserve moisture, and keep down weed growths.

With deep soils of a loose nature subsoiling is not necessary, but where there is a stiff subsoil, or hard pan in places, a subsoiler should be used. If in any places where a tree will be planted there should happen to be a small stratum of rock a few feet below the surface, an explosive should be used to burst up the formation so as to allow the roots to strike down.

If planting trees along a boundary, plough the strip and treat the same as already stated. When planting individual trees around the homestead, or about the estate, dig a hole not less than 3 feet square and remove the soil to a depth of about 2 feet, keeping the subsoil apart from the surface soil. Break up the soil at the bottom of the hole about 12 inches deep, and allow it to remain in the rough or lumpy state.

Leave the hole open and exposed to the atmosphere for about one week before planting. If rain has fallen in the meantime loosen up the bottom of the hole again when planting. If water remains in the hole and does not soak away for some time after rain, it is a sure sign that soil conditions are not suited, and the walnut will not thrive. (*See* Planting.)

(To be continued.)

CLOSER SETTLEMENT IN THE KIEWA VALLEY.

By W. C. Robertson.

Passing the Kiewa Post Office every day during the first week in July, and many days before and after this date, one may notice a couple of large lorries heavily laden with cauliflowers and cabbages.

Casual inquiry elicits the information that the lorries are owned by Mr. W. Simmons, locally known as "The Cauliflower King," and are on their way to the railway station at Huon, on the Tallangatta to Wodonga railway, there to discharge and transport their valuable and useful freight to the Albury market.

The sample of the vegetable, the large consignments (500 dozen have been consigned in one day) together with the environments, suggested an inquiry, and with this object in view Mr. Simmons' farm was visited and its owner interviewed.

The farm is beautifully situated in the Kiewa Valley, 7 miles from the nearest railway station, viz., Huon, and is part of the Springvale Estate of 3,396 acres bought and subdivided for closer settlement by the Government during the year 1905.

The particular holding under review comprises 106 acres, the price paid being £12 10s. per acre.

Mr. Simmons is a past-master in the art of vegetable culture, with wide experience gained in the metropolitan district.

On acquiring his holding in the Kiewa Valley he commenced growing cauliflowers and cabbages whilst laying out and planting an orchard. A visit to the farm and a chat with its friendly, modest, hard-working proprietor, speaks for the success of the enterprise.

The vegetable branch of intense culture requires experience and a deal of hard work to engender success. The preparation of the ground, planting out and watering, subsequent cultivation, and the cutting, bagging, handling, and cartage meaning a lot of labour in a short space of time.

Twenty-five acres of the total area of 106 acres are under cauliflowers and cabbages.

Five thousand plants are planted to the acre, the ground being previously treated to a dressing of 4 cwt. of bone and superphosphate, or bone and blood per acre. The manure is sown broadcast and ploughed in, it being considered better to do this than to "dibble" the fertilizer around each plant, in which case the roots mat in the vicinity of the manure and destroy, in their greediness, the development of a good root system.

As the plants are planted they are watered once by hand.

The field presents a magnificent sight in the zenith of its growth; the plants are fresh, crisp and healthy, of a nice even size, averaging about 7 lbs. in weight, but cabbages have been cut scaling 20 lbs. There are very few "misses," which speaks well for the care and attention bestowed on the plants in the early stages of growth.

With 5,000 plants per acre, averaging 7 lbs. per plant, the total green yield would be between 15 and 16 tons per acre. This is a very conservative estimate.

Apart from the produce sent away from the farm it should be remembered that the stock receives very good picking

The market is at Albury, where the price obtained is 1s. in advance of the Melbourne market, mainly accounted for by the difference in freight.

At 2s. 3d. per dozen the gross return would be approximately £45 per acre—the 25 acres yielding £1,125.

During the course of conversation Mr. Simmons remarks "it is not all gold that glitters," inferring that there is not a fortune returned for his hard labour. However, as his wife knowingly interrupts to say "they are making a little," it is fairly safe to assume with the figures given above that this "little" amounts to a goodly sum per acre.

The surface soil is a rich, dark loam, open, sweet, and mellow; its fertility is standardized by its productivity.

The object of this note is not so much to prove the lucrativeness of cauliflower and cabbage culture, but rather to draw attention (*a*) to the fertility of the soils in the Kiewa Valley; (*b*) to an instance of pronounced success attending closer settlement; and (*c*) to the resourcefulness and keenness of one man forsaking a centralized for an outside market, grasping the opportunity of obtaining cheap land, risking the labour trouble, and by dint of hard work and a little capital, showing all and sundry what the soils of his country will do and how to "make a little" under closer settlement conditions.

GREEN MANURING.

Green manuring is effective both on sandy and heavy clay soils, and, indeed, in all soils deficient in humus.

On sandy soils its effect is to consolidate the soil, and in clay soils it acts by loosening the texture and letting the air act on it. When conditions as to warmth and moisture are favorable, the green crop decomposes without much delay, and the production of a soluble plant food proceeds with considerable rapidity.

This is especially the case with the valuable nitrogenous portion of the green stuff. Nitrification, that is the conversion of the nitrogenous material of the plant into soluble nitrates, takes place quickly. In sandy soils green manure nitrifies more quickly than ordinary organic manures, such as bone dust, ground horns, dried blood, &c., while in stiff clays it nitrifies more rapidly than even sulphate of ammonia or animal manures.

The need of a large proportion of our northern wheat soils is humus, and this method of supplying it is being carefully tested at the Rutherglen Experiment Station.

Wheat and sheep are the principal combination in our northern areas, and it may pay the farmer better to feed off the green crop than to plough it in. This method is being compared with the green manuring at the above station, and the relative effect on the following wheat crops should prove of unusual interest to farmers.

It is the man on the land who is the foundation of our country, and we shall start our young people with the greatest of advantages if we give them a correct knowledge of the land and what to do with it to attain success.

SEAWEED FOR MANURE.

Sea weed, which is plentiful on some coasts, forms a cheap and valuable manure.

The composition varies with the variety, but the following may be taken as the approximate analysis:—

Water	80 per cent.
Organic matter	10—20 per cent.
Nitrogen	.3—.73 per cent.
Potash	.3—1.9 per cent.
Phosphoric acid	.1— .5 per cent.

From the above analysis it will be seen that sea weed is comparable as a manure with farmyard manure, being, however, slightly deficient in phosphates.

It has the advantage of being free from weed seeds.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY 1914-1915.

Monthly Report Ending 14th September, 1914.

The output of eggs for the past month has been steadily maintained. In Wet Mash the second pen (E. A. Lawson) has slightly reduced the lead of J. H. Gill, whilst the third pen (J. J. West) is improving its position. The leading three pens in the Dry Mash are still in the same order. The Heavy Breeds are also doing splendidly and are well deserving of the extra pens that have this year been allotted to them.

The weather conditions have again been favourable for egg production, the days being bright and warm, although there has been one or two slight frosts.

The system of feeding is similar to last month with the exception that maize has been reduced as the days are getting warmer and the hot weather approaching. This is fed as a change of diet only in limited quantities.

The general health is good, the birds being bright, alert, and vigorous, with good appetites. One or two birds had to be isolated for digestive trouble in the Dry Mash. One death occurred in pen 70, Dry Mash.

The rainfall has been very light, 73 points only being recorded, which mostly fell at night.

The average weight for eggs laid in August was 2 ounces, or better, for all of the pens, none in consequence having to be disqualified for underweight, which is very satisfactory.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th August.	15th Aug. to 14th Sept.	Total to date, 5 months.	
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns ..	J. H. Gill	565	143	708	1
36	" ..	E. A. Lawson	533	151	684	2
9	" ..	J. J. West ..	501	154	655	3
10	" .	R. Hay	500	134	634	4
16	" ..	A. R. Simon .. .	475	142	617	5
40	" ..	*J. Schwabb* ..	446	147	593	6
26	" ..	Mrs. H. Stevenson ..	435	156	591	7
17	" ..	F. Doldissen	444	143	587	8
37	" ..	S. Brown	453	132	585	9
44	" .	A. Ross . ..	442	134	576	10
33	" ..	W. G. Osborne	420	146	566	11
20	" .	V. Little	423	142	565	12
35	" ..	W. Tatterson .. .	422	139	561	13
45	" ..	H. C. Brock	431	129	560	14
19	" ..	Marville Poultry Farm ..	419	132	551	15
3	" ..	T. A. Pettigrove ..	435	113	548	16
4	" ..	Giddy and Son	406	134	540	17
12	" .	A. H. Mould . .	402	126	528	18
11	" .	C. J. Jackson	387	138	525	19
23	" ..	S. Buscumb .. .	397	125	522	20
47	" ..	W. G. Swift	370	134	504	} 21
15	" ..	E. Waldon	354	150	504	}
34	" .	W. A. Rennie	374	123	497	23
28	" ..	Utility Poultry Farm ..	365	122	487	} 24
1	" ..	F. G. O'Bree	340	147	487	}
13	" ..	H. Hanbury	365	119	484	26
30	" .	G. W. Robbins	348	133	481	27
48	" ..	Bennett and Chapman ..	336	138	474	28
8	" ..	F. W. Brine	334	135	469	29
2	" ..	J. C. Armstrong ..	339	128	467	30
24	" .	C. Pyke	333	132	465	31
22	" ..	B. Mitchell .. .	322	138	460	32
6	" ..	C. B. Jones	307	133	440	33
14	" ..	F. C. Western .. .	288	144	432	34
42	" ..	E. W. Hippe	291	138	429	35
20	" ..	A. W. Hall	278	141	419	36
32	" ..	Gleadell Bros. .. .	297	116	413	37
38	" ..	G. Hayman ..	286	126	412	38
18	" ..	All-lay Poultry Yards ..	260	138	398	39
21	" ..	R. A. Lewis	266	123	389	40
31	" ..	E. H. Bridge	263	121	384	41
49	" ..	A. Beer	238	128	366	42
5	" ..	A. Mowatt	221	140	361	43
41	" ..	Doncaster Poultry Farm ..	228	125	353	44
43	" ..	G. Mayberry	222	120	342	45
39	" ..	R. L. Appleford ..	184	124	308	46
27	" ..	Walter M. Bayles ..	192	110	302	47
46	" ..	C. L. Sharman	163	125	288	48
50	" ..	F. G. Silbereisen ..	154	122	276	49
7	" ..	B. Cohen	144	99	243	50
		Total	17,398	6,632	24,030	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th August.	15th Aug. to 14th Sept.	Total to date. 5 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	522	155	677	1
55	" ..	E. A. Lawson	507	157	664	2
65	" ..	W. G. Osborne	468	143	611	3
53	" ..	C. Lawson	453	133	586	4
58	" ..	Miss L. Stewart	420	138	558	5
51	" ..	Moritz Bros.	370	148	518	6
61	" ..	H. Hanbury	363	151	514	7
63	" ..	Hanslow Bros.	335	128	463	8
68	" ..	E. W. Hippe	335	99	434	9
70	" ..	W. H. Robbins ..	267	141	408	10
62	" ..	A. Greenhalgh	275	124	399	11
52	" ..	Myola Poultry Farm ..	253	144	397	} 12
64	" ..	E. A. Carne	249	148	397	
69	" ..	C. J. Beatty	261	135	396	14
57	" ..	J. Jackson	276	112	388	15
54	" ..	G. Carter	239	139	378	16
67	" ..	Walter M. Bayles ..	259	114	373	17
59	" ..	F. G. Silbereisen ..	188	162	350	18
66	" ..	S. Brown	130	90	220	19
		Total	6 170	2,561	8,731	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	*J. McAllan*	502	152	654	1
71	" ..	J. Ogden	494	140	634	2
81	" ..	D. Fisher	473	129	602	3
89	" ..	Marville Poultry Farm ..	438	160	598	4
88	" ..	H. H. Pump	436	157	593	5
82	" ..	J. H. Wright	429	149	578	} 6
84	Rhode Island Reds	J. Mulgrove	454	124	578	
76	Black Orpingtons ..	W. P. Eckermann ..	405	105	510	8
74	" ..	S. Brown	364	139	503	9
72	" ..	T. W. Coto	360	126	486	10
75	" ..	Fairdeal Poultry Farm ..	352	127	479	11
83	" ..	Cowan Bros.	358	113	471	12
73	" ..	J. A. McKinnon ..	284	150	434	13
87	" ..	A. Douglas	275	145	420	14
78	Red Sussex ..	Jorgen Anderson ..	303	98	401	15
85	Golden Wyandottes	J. C. Mickelburgh ..	247	118	365	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	165	92	257	17
86	Buff Wyandottes ..	W. G. Swift	193	62	255	18
		Total	6,532	2,286	8,818	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	431	133	564	1
94	" ..	T. W. Coto	400	107	507	2
97	" ..	J. McAllan	339	137	476	3
90	" ..	J. H. Wright	321	139	460	4
98	" ..	A. Greenhalgh	347	112	459	5
91	" ..	C. E. Graham	279	140	419	6
96	Rhode Island Reds	*Myola Poultry Farm* ..	247	138	385	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	225	125	350	8
93	" ..	Myola Poultry Farm ..	227	109	336	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	103	120	223	10
95	" ..	C. L. Hewitt	56	53	109	11
		Total	2,975	1,313	4,288	

A. HART,
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Department of Agriculture,
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ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture by means of capillary attraction. So that after rains, heavy dews, spray pump, and other traffic, it will be advisable to run the harrows through the orchard, to keep the surface well broken, so as to maintain a good earth mulch. If after the ploughing it be found that the surface is cloddy, and that the harrows will not break the clods down, the soil must be well rolled with a spike or an ordinary round roller, and then afterwards harrowed. In ploughing, particularly if the weather is at all dry, it is advisable to plough only so much as may be harrowed the same day. By immediately following up the ploughing with harrowing, very little evaporation of soil moisture takes place; the soil, too, being freshly ploughed and somewhat moist is much easier harrowed, and the whole of the cultivation work is rendered much more valuable, especially in the conservation of the water in the soil.

Green manure crops should now be ploughed under; if these crops are at all abundant in growth, they should be well rolled or dragged down with a chain, or they should be run over with a disc. Any of these means will assist in getting the whole of the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress all weeds, which rob the trees of both water and food. The suppression of weeds is an important work in the spring and early summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time, an important work in the orchard. Bordeaux spraying for black spot of apples and pears, for scabs and shothole in apricots and peaches, for leaf curl of peach, and for rust of plums and peaches should now be completed. Where there are indications that previous sprayings have not been thoroughly successful, a second spraying should be given.

Wherever they are present, nicotine sprays should be used to combat peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the codlin moth spraying, it is of quite the opposite value when used for cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season it is just possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the bloom period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for codlin moth, nothing having been found to supersede it.

General.

Citrus trees of all sorts may now be planted, care being taken that neither the young trees nor the soil is allowed to dry.

Graft ties will need examining, and, where any growth has taken place, they may be loosened slightly. In hot, dry, or windy weather the grafts will benefit greatly by an occasional spraying with water. On such days the transpiration of moisture from the foliage is very great, and, so far, a perfect union has not taken place; thus there will be a loss of sap, which cannot readily be replaced, and the graft will probably suffer considerably.

Vegetable Garden.

A good tilth, and a well pulverized surface, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for constant surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones; thus, a good water supply will need to be maintained. Weeds are great moisture robbers, and they should be kept rigorously out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early planted plants should be fed, staked, and the laterals pinched back. A little bonedust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in a limited quantity. Six or seven cwt. per acre would be a heavy dressing, and this works out at nearly three ounces per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that three ounces scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops when planting out, as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths of asparagus as are not gathered for cooking purposes, although these are invaluable for flavouring and for soups, should be kept cut out of the beds.

Celery trenches will need attention at this season; and, to insure good and quick growth, frequent waterings will be necessary.

Flower Garden.

Flower gardens are troubled with many pests at this season of the year. Rose aphis is one of the most prevalent. Frequent applications of a strong tobacco spray will keep this pest in check. It has been urged that, because this pest disappears on the occurrence of the first hot wind, it is not necessary to worry much about it. This is a very fallacious argument, as the hot winds do not generally come until the aphides have done a considerable amount of damage; and, further when the aphides do disappear many of them simply go underground to hibernate until another favorable season.

Rose mildew will also require combating. The bushes should be sprinkled or dusted with sulphur, while the foliage is still wet with the morning dew. Dusting sulphur on the ground under the bush is also effective, the sulphur fumes acting as a check on the fungus.

Leaf-rolling and leaf-eating insects will need to be suppressed by spraying with arsenate of lead or Paris green.

The surface must be kept well hoed, so as to keep in as much soil moisture as possible. Dry soils will need frequent waterings, with a hoeing as soon as convenient after each.

Preparation will now be made for the planting of dahlias and chrysanthemums. The beds should be well dug over two or three times, well mixing the manure with the soil at each digging. The soil must not be too rich, and a well-drained condition is an essential.

Bulbs that have finished flowering and that have lost their foliage, should be lifted and stored. The foliage must not be cut off, as this means loss of sap and energy.

Tender and half-hardy and other annuals may be planted out now, for summer and autumn flowers. These include asters, zinnias, salvias, balsams, amaranths, celosias, &c. Lobelia, bedding begonia, iresines, alternantheras, &c. may now be planted out.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares in foal should be put on poorer pasture. Turn out workers due for a spell at grass. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Beware of milk fever. Read up method of treatment in *Year-Book of Agriculture*, 1905. Have cows' milk weighed and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Give calves a warm dry shed and a good grass run. Keep calves' premises scrupulously clean and regularly disinfected with Phenyle or Condy's Fluid. Feeding vessels must be kept clean. Skim milk should be scalded, unless it is known that the cows are healthy. Give the calves a regular quantity, and do not overfeed. Better too little than too much. Give milk at blood heat. Dehorn all calves, except those required for stud or show purposes.

PIGS.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Read articles on breeding and feeding in *Journals*, April, 1912, and June, 1913.

SHEEP.—Prepare for dipping. Powder or paste dips have the most lasting effects, particularly where lice have been bad. Ascertain correct contents of bath before mixing. Keep sheep in bath not less than half a minute, if badly infested, longer. Submerge heads twice. Allow them rise quickly. Dip big sheep first, lambs last. Yard sheep overnight; dip while empty, and avoid fouling the drainer so much. Commence early in the day, and the sheep can dry before nightfall. Avoid travelling long distances to baths and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths, particularly in hot areas; filth increases a dead tip; clean out the bath occasionally. Merino and fine comeback ewes come in season, as a rule, now. Mate plain roomy ewes to level, thick-shouldered, good fleeced Lincolns; yolky, wrinkley sorts to English or Border Leicesters; very small merino ewes to blue-faced, medium-boned old type English Leicester, these latter cause less lambing troubles.

POULTRY.—Provide plenty of green food and shade. Watch for vermin; spray perches with kerosene and houses with solution of 3 per cent. crude carbolic acid mixed with a little lime and soft soap. Keep water clean and cool. Discontinue feeding maize and reduce meat ration. Some Epsom salts should be placed in water weekly. Fresh skim milk, if available, should be given. Remove all male birds from the flock. Infertile eggs only should be used when pickling, or when placed in cool storage.

CULTIVATION.

FARM.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

ORCHARD.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

VEGETABLE GARDEN.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

FLOWER GARDEN.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

VINEYARD.—Field grafts require careful attention in the way of removal of suckers and scion roots. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a " mulch " as possible during summer. Proceed with tying up, stopping, and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines as soon as flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.

QUESTION AND ANSWER.

W.E.D., Camberwell, has yellow gage plum attacked by root borer, and wishes to know how to combat same.

Answer.—The cause of the trouble is, no doubt, the plum borer and not apple root borer. Scrape away excreta from the boughs, soak a piece of rag or cotton wool with bisulphide of carbon and place it in the tunnel made by these insects in the trees, and then cover the hole immediately with soap or clay.

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BLUE MOULD IN TOBACCO.

By Temple A. J. Smith, Tobacco Expert.

Possibly the greatest hindrance to the quick development of the tobacco industry in Victoria lies in the damage and loss sustained by the young plants in the seed beds due to the fungoid disease known as Blue Mould (*Perenospora hyocyami*), which, in cold, wet seasons, attacks the plant generally just before it is ready to be transplanted in the field. The area of seed beds necessary to produce sufficient plants for an acre is small. A bed 3 feet wide by 10 feet long should provide no less than 4,220 plants, giving each one square inch in which to develop, and about that number is required for large tobacco per acre, while for cigar and cigarette leaf about double the quantity is found necessary.

Various theories have been put forward by growers as to the cause of the trouble, some claiming that it originates in the soil, others that it is atmospheric. Personally, I am of opinion that it is a soil condition developed by climatic changes and temperatures.

The spores of most fungoid diseases develop fastest at comparatively low temperatures, and higher degrees of heat will, as a rule, destroy them; temperatures of 75 deg. to 80 deg. Fahr. being sufficient for such a purpose. A difficulty which confronts the grower where spraying operations have been employed is the habit of growth of the young plant, the leaves in the early stages lying flat on the ground, and later on when they are ready to pull, they are so thickly bunched together that it is impossible to reach all parts of the plants by such treatment. The mould always makes its appearance first underneath the leaves, in spots having a bluish-grey tint somewhat like the potato blight, which it closely resembles. From this stage it spreads in some cases very quickly, covering the whole plant, which wilts and dies in a few days unless the disease is checked. Beds are sometimes attacked in a mild form, and recover again for some unknown reason, probably a change of temperature, and in some cases this has occurred several

times in one season. The stem and roots of the plant become affected, the former acquiring a black tinge underneath the outer skin, and the roots rot away very fast.

Experimental work has been persevered with for many years by the Department of Agriculture, with a view to curing or minimizing the trouble, and treatments of the soil with formalin, toluol, boiling water, sulphur, bluestone, lime, and steam have been used, and sprays of many kinds have been tried, the latter, however, proving ineffective. Actual practical experiment has also been required to ascertain the exact strength necessary to sterilize the soil by the use of fungicides, at the same time watching the effect on the germination of the seed.

Results have been obtained during the past year which, though not revealing a complete cure or prevention, have shown such marked effects as to be worth recording, and further work appears to have every promise of success.

Messrs. Rae Brothers, Gapsted, and D. Gibson, Edi, have co-operated with the Department of Agriculture in the experimental tests, and are to be highly commended for their efforts. Beds 3 feet square were treated in the following manner:—

Formalin.	Toluol.	Check Untreated.	Boiling Water.	Lime.
1	2	3	4	5

Number 1—the formalin bed—was treated with a solution of 1 lb. formalin, 40 per cent. strength, with 100 lbs. of water, and applied to the bed with a watering-can and covered with straw to keep in the fumes, and the seed sown six days after the application, the soil being well stirred before the seed was sown in August, 1913.

Number 2—the bed treated with toluol—in the same manner and proportions.

Number 3. The bed in the centre was given no treatment, and was sown under ordinary conditions.

Number 4. Received 2 gallons of boiling water per square foot.

Number 5. Received a dressing of 1 lb. of lime per square foot.

The seed was sown in all the beds on the same date.

The season was a particularly bad one for Mould, and all the beds surrounding the test plots contracted the disease badly, and finally died off, as also did the check plots, while all the treated plots still have plants growing in them 3 feet high. Mould showed in each, but a handsome recovery has been made.

Germination was affected most in the formalin and toluol treated beds, the plants coming thinner and slower. In the bed treated with boiling water germination was fastest, and in the limed bed about normal. The last-mentioned bed, however, flaked on the surface, and in future operations the lime will be mixed at a greater depth.

All the test beds were covered with hessian, which is a wise course to follow, as a more regular temperature is maintained.

The cost of treating the beds in the manner mentioned is a mere bagatelle, and the saving in risk and weeding more than compensates for the trouble involved in treatment.

Further experiments, based on previous years' experience, will be carried out this season, which, it is expected, will lead to more successful results.

Steaming had the same effect as the application of boiling water.

Variety Experiments.

A number of varieties of tobacco—embracing plug, cigar, and cigarette varieties—were grown, and though the season proved unsuitable and many failed entirely, two new kinds stood out as being distinctly an improvement on the sorts previously grown in this State. These were Spotted Gum—a fine plant introduced from South Africa, suitable for plug or cigarette, and growing a fine big leaf, very wide, and with a fine texture and small vein. When grown on a light soil this tobacco promised well for cigarette manufacture, and when grown on a heavy soil, for plug.

The best cigar variety was Pennsylvania seed leaf, and this should prove of value for cigar filler and bunch wrapper, being of long, fine texture and sweet smoke.

A nice quantity of seed was obtained from Blue Pryor (heavy plug), Hester (cigarette and plug), Pennsylvania, White Stemmed Oronoco (cigarette), Spotted Gum, &c.

Recent Tobacco Sales.

During the season some highly satisfactory sales of Victorian tobacco leaf have been made.

Cigar leaf from Eastern Gippsland has been sold for 1s. and 1s. 9d. per lb., and plug leaf—heavy grade—up to 9d. per lb.

Two new manufacturing firms have come into the market prepared to purchase up to 120 tons of leaf annually at the above prices, and up to 2s. per lb. for cigar and cigarette leaf of best quality.

For the first time in the history of Victoria cigarette leaf of good colour ("lemon bright") and thin texture, containing a very small *percentage of gum, has been satisfactorily produced and sold at good* prices, viz., from 1s. to 1s. 6d. per lb.

Buyers are prepared to purchase large quantities of this class of tobacco at up to 2s. per lb., provided the quality is right.

DETERIORATION OF PASTURES.

Among the causes leading to deterioration of pastures in New Zealand, the chief—and one of the greatest mistakes a farmer can make—is undoubtedly continuous over-stocking, more so in the case of sheep stock. No pasture, however rich, will stand continuous close grazing by sheep. It is admitted that sheep do not thrive well when the feed is long, and it is a true saying that "a sheep may starve in the midst of abundance"; but there is always the happy medium between the two. Where possible, both cattle and sheep should be kept, the latter invariably following the former; and where sheep only are kept the pastures should receive an occasional spell to permit the recovery of the finer grasses and clovers, which constant close grazing will eventually kill.—P. McConnell, *Journal of Agriculture*, New Zealand.

WHEAT BREEDING IN AUSTRALIA.*

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Present Status of the Wheat Industry.

The present annual production of wheat in Australia, in round numbers, approximates 100,000,000 bushels, grown on an area of 8,000,000 acres.

This represents, however, only a fraction of the possible production when all the wheat lands are brought under cultivation, cultural methods are improved, and hardy, prolific types of wheat suited to the needs of the climate have been evolved.

Some idea of the potentialities of the industry may be gained by considering the distribution of rainfall over the continent and the vast areas of land awaiting exploitation. So far as the rainfall is concerned, the continent may be divided into three more or less concentric zones, each containing 1,000,000 square miles, namely:—

(1) The high rainfall belt (20 inches and over), coloured green in the accompanying map.

(2) The intermediate belt (over 10 inches and under 20 inches), coloured yellow in the accompanying map.

(3) The low rainfall belt (under 10 inches), coloured grey in the accompanying map.

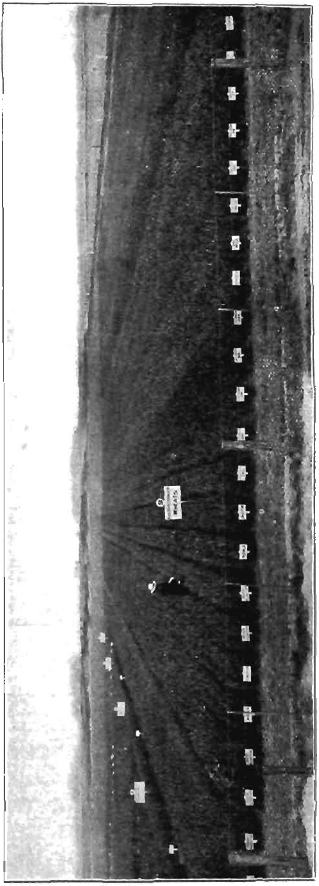
Excluding the tropical portion, these areas correspond roughly to—(1) the Dairying Belt, (2) the Wheat and Sheep Belt, and (3) the purely Pastoral Area.

On the accompanying map of Australia the isohyets, or lines of equal rainfall, have been marked, and the actual area of land under cultivation and under wheat in each of the wheat counties of the Commonwealth have been drawn to scale. The most striking feature of the map is the vast area in the wheat belt awaiting systematic exploitation.

It will be noticed that in South Australia the margin of cultivation has already been extended to the 10-inch isohyet, and profitable wheat cultivation is now carried on in districts with an annual rainfall of under 10 inches. Even if this isohyet represented the ultimate limit of profitable cultivation, there would still be vast areas in each State enjoying a much better rainfall that could be devoted to extension of the industry. Thus, in the four wheat States—New South Wales, Victoria, South Australia, and the southern portion of Western Australia, there are 200,000,000 acres of land lying between the 10-inch and 20-inch isohyets, only a small fraction of which has been brought under the plough, and which is well suited for wheat production. Indeed, in New South Wales and Western Australia the greater part of the area lying between these isohyets is still held under pastoral conditions.

But there is no reason to suppose that profitable wheat culture should stop even at the 10-inch isohyet. The effectiveness of a given rainfall depends on its incidence rather than on the actual quantity that falls. And the wheat areas of the southern States, 75-80 per cent. of the total rain falls during April to October—the growing period of the wheat, and when the losses by evaporation from the soil are at a minimum.

* Paper read before British Association for the Advancement of Science, Sydney, 1914.



View of Crossbreeding and Selection Plots, Central Research Farm, Werribee.

With increasing efficiency in cultural methods and the general use of moisture-saving fallows, it is quite certain that the margin of cultivation will be pushed far beyond the present limits of cultivation. Lands considered "unsafe" for farming a decade ago are now producing millions of bushels annually, and the "unsafe" lands of to-day will be the granaries of to-morrow. But for the fullest utilization of our semi-arid lands the production of *hardy, drought-resistant, prolific wheats*, suited to the needs of the climate, is essential. With effective tillage and the full exploitation of the wheat belt by the use of hardy varieties, there can be no doubt that the industry will ultimately treble or even quadruple its present production.

The Wheat Breeder's Problem.

Soil moisture is the limiting factor in Australian wheat production. The soils of the wheat areas are rich enough, but they fall short of yielding heavy crops *because of the limited rainfall. That is one* important reason why bare fallowing is regularly practised in our wheat areas—a practice that may, perhaps, seem wasteful to European eyes.

In a climate where soil moisture is the limiting factor to production *the raising of prolific, xerophytic types which will use transpired water* economically is of the utmost importance.

With a few exceptions, the varieties of wheat grown in Australia are not well suited for arid conditions. They have, for the most part, originated from types brought by the pioneers from the humid countries of the Old World. Many of these are flaggy varieties, containing a high proportion of leaf and straw to grain, and are too uneconomical in the use of transpired water, and mature too slowly for the drier areas. *The late maturing, vigorous stooling, flaggy varieties* which have a protracted growing period, and which give such heavy yields when sown in cool, humid climates, are of little use in the drier districts. The hot, dry winds so frequent in early Spring in Australian wheat-fields play havoc with such types. In these arid areas, types are required that will be well on towards maturity before the inevitable hot winds of Spring set in.

Exactly what physiological and structural characteristics make for drought resistance in wheat plants have not been definitely worked out. *Capacity for resisting drought may, perhaps, be correlated with an* inherent capacity for developing high osmotic pressure in the plant cells, thus enabling these types to successfully abstract moisture from very dry soils; or it may be governed by the number, magnitude, and *character of the stomata or the presence of hairy or waxy coverings on* the leaves; all of which would tend to regulate the amount of water transpired. Varieties which show the greatest xerophytic capacity under Australian conditions are the short-strawed, narrow-leaved, spare-*stooling, early maturing types* bearing a high proportion of grain to straw.

How Existing Types have been Obtained.

A country situated similarly to Australia may derive new and valuable varieties of wheat in three ways—(1) the isolation of prolific impurities or of high yielding mutants from the varieties already growing here, (2) the introduction and acclimatisation of wheats grown in foreign climes, and (3) the production of new articles by cross-breeding and hybridising.

(*a*) *Isolation of Mutants.*—Many of the improved varieties have resulted from the isolation of high yielding mutants or prolific impurities among the original strains. A conspicuous case in point is the separation in 1882 of Dart's Imperial, from a crop of Purple Straw. This new variety has retained its original characteristics for over 30 years, and is still one of the most consistent and reliable yielders in the wheat belt. Among a large number of varieties obtained in the same way may be mentioned Marshall's No. 3, Steinwedel, King's Early, Gluyas, and Petatz Surprise, which are largely grown in the drier wheat areas.

(*b*) *Acclimatisation.*—The introduction of wheats produced under foreign climes is likely to prove of value in two directions—(*a*) as a direct source of new and useful varieties, (*b*) as an indirect means by crossbreeding, of improving prolific local types with the specific excellence of the introduced type. Bearing in mind the paramount importance of hardy, drought-resistant prolific types for our drier areas, it will be readily seen of what great value the introduction of varieries grown for generations in the very driest areas of the Old World would be. Some preparatory period of acclimatisation is, however, necessary before these varieties show up well under Australian conditions, and unless extended trials are given new varieties may be *prematurely discarded before their real value is discovered.*

Experience with the growing of certain Russian, Indian, Mediterranean and Durum wheats in Victoria and South Australia during the past seven years has demonstrated that whilst the majority of these varieties rarely do well under Australian conditions the first year or two they nevertheless adapt themselves to the new environment. Such adaptation or acclimatisation may be accounted for by the fact that whilst the individual plants of a given variety appear to be morphologically uniform they really differ considerably in their capacity to resist drought, and, consequently, increased powers of drought resistance under ordinary field conditions would result from the increase in the number of resistant types from year to year. Such acclimatisation would, therefore, be hastened considerably by artificial selection. Turkey Red, Kubanka, and American 8 may be mentioned as varieties of this class of quite recent introduction which have been grown on a considerable scale.

(*c*) *Crossbreeding.*—But by far the most prolific and promising source of new varieties is the production of new types by crossbreeding and hybridisation. The outstanding figure in Australian wheat breeding is the late William Farrer, whose work has been worth millions sterling to the Australian wheat industry. The man who could, as Farrer did in 1898, clearly define his objectives in wheat improvement, and in less than a decade flood the market with varieties like Federation, the most prolific wheat in the Commonwealth at the present day; Bobs, Comeback, Cedar, varieties of the highest milling excellence, which are quoted at 2s. to 4s. per quarter above ordinary varieties; Florence and Genoa, bunt-resisting types; Bunyip, Firbank, Cleveland, Bayah, and a host of others enjoying widespread popularity, must have possessed, in an unusual degree, the insight of genius. He certainly demonstrated in a unique, practical, and convincing manner the value of systematic plant breeding to the agricultural community,

and his achievements were the more remarkable in that they were made prior to the extraordinary outburst of enthusiasm for genetic research consequent on the re-discovery of Mendel's Law by De Vries, Correns, and Tschermak. Other prominent workers in the production of new varieties by crossbreeding are Messrs. Pye, of Dookie Agricultural College, Marshall and Correll, of South Australia, Sutton and Berthoud, of Western Australia.

Wheat Breeding Organization in the States.

Sixteen years ago, when Farrer outlined his objectives in wheat improvement at the Australian Association for the Advancement of Science, his ideas were regarded by many as those of a visionary. Time, however, has completely justified his cheery optimism, and has demonstrated the practical value of his work. Owing to the remarkable success of Farrer's work and to the growing recognition of the importance of systematic breeding to the agricultural community, the four wheat States of the Commonwealth have embarked on an active policy of cereal breeding. In New South Wales the bulk of the work is carried on at the Cowra Experiment Farm, and the Hawkesbury Agricultural College and various Experiment Farms are used as testing stations for the newly evolved types. In Victoria, cereal breeding forms a prominent feature of the work at each of the Experiment Farms and the Dookie Agricultural College. In South Australia, a considerable amount of attention has been given to wheat breeding at the Roseworthy Agricultural College and the Experiment Farms, whilst private breeders like Marshall and Correll have devoted much attention to this work.

In each of these States experimental flour mills and electric baking ovens have been installed for the purpose of testing the new varieties, and a definite idea of the milling and baking quality of each new crossbred is thus obtained long before it is ready for general distribution.

The Work of the Wheat Breeding Stations.

The work at the Wheat Breeding Stations in each State comprises:—

(1) *Testing and acclimatisation of introduced foreign types.*
(2) Selection of qualitative and quantitative variations.
(3) Crossbreeding and general research work.

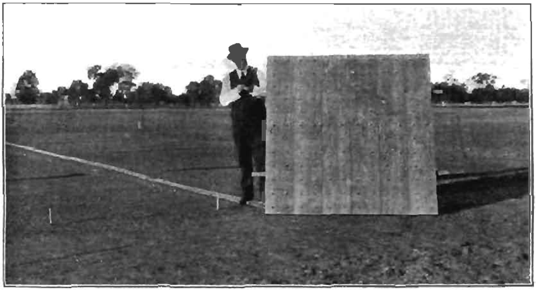
(1) *Acclimatisation* has already been discussed.

(2) *Systematic selection* is resorted to for the production of improved varieties. The efficiency of selection for the improvement of qualitative characters in plants has been well established. The gradual increase in the sugar contents of beets and the oil and protein content of corn are cases in point. An interesting case is the production from Kings Early Wheat by Perkins (South Australia) of two distinct types—the white and red berried varieties—both of which are extensively grown under the name of Kings White and Kings Red. The production, by Pridham (New South Wales), of a strain of Federation wheat containing hard translucent endosperm from the soft berried type is another interesting case.

So far as the quantitative characters are concerned, a considerable amount of work has been done to improve the standard of prolificacy of varieties in general cultivation in Australia by processes of continuous selection.

In South Australia, Perkins has for some years carried out a process of continuous selection of wheat based on the isolation each year within pedigree stud plots of the superior plants, and the use of these as foundation stock for the gradual amelioration of the type. It may be described as continuous selection applied to quantitative variations. The prolificacy of a number of pure strains has been raised by this process of uninterrupted selection.

One obvious difficulty in such work is to ensure that the chosen plants are really superior and not merely high variants in a population of low mean values. That is to say, the success of such selection depends on the perpetual choice of plants that are superior, not merely in appearance, but in actual performance. This difficulty may in a measure be overcome by using a system of Centgener Plots, arranged and prepared so as to provide equality in environment for the isolation of the high-yielding types, and then applying mass selection methods to the progeny. In this manner the whole polygon



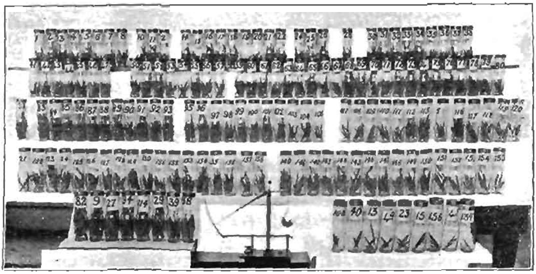
A Centgener Planting Board.

of variation is moved gradually and definitely in the direction of increased prolificacy.

The method of selection now employed at the Experiment Station, Rutherglen, Victoria, is to sow, for each variety tested, a number of plots containing 144 seeds from each selected plant at a uniform depth in a square, 12 seeds each way, by means of a specially constructed centgener planter. At harvest the outside rows are removed, and the central hundred plants used as a register of the prolificacy of the original selection. Selected progeny of the most prolific selection, as determined in Centgener Plots, are sown on a "Selection" plot of one-twentieth of an acre, and each year the prolificacy is maintained by the repeated choice of the elite plants. The produce of the "Selection" plots passes automatically to the "Seed" plots, which in turn furnish the seed for the main farm areas. That this method of selection is effective is shown by the fact that eight varieties of wheat subjected for three consecutive seasons to such methods have given increased yields ranging from 14 per cent. to 38 per cent.

This system of Centgener plots is also being used at Rutherglen to determine the extent to which quantitative variations are inherited within pure lines, and the effect of various environmental influences on the coefficient of variation and the coefficient of heredity.

(3) *Crossbreeding.*—Great impetus has been given to Genetic Research during the last ten years by the re-discovery of Mendel's Law of Segregation, and many interesting applications of this law have been worked out for the inheritance of unit characters in wheat. Very little has yet been done, however, regarding the mode of inheritance of quantitative characters such as prolificacy. This is a matter for regret for these are the characters of practical value to the wheat industry. That some form of segregation does take place when high and low yielding varieties of wheat are crossed together, and that new forms may be obtained by a re-combination of factors giving rise to types exceeding the parents in prolificacy is suggested from the researches of Nilsson Ehle, but definite and exact data on this important question



Determination of Migration Ratio in Selected Strains of Federation Wheat.

is wanting. Much exhaustive work has been done by Tschermak, Spillman, Howard and others on the mode of inheritance of botanical characters such as color of chaff, density of head, structure of glumes, roughness of foliage, beardedness of the ear of wheat, and character of the straw. But these characters concern the general problem of heredity rather than the production of improved and intrinsically valuable varieties. On the other hand, the researches of Biffen, concerned as they are with rust resistance and with the combination into one variety of the apparently antithetical attributes of prolificacy and high milling and baking quality are of great practical value.

Practical Objectives.

A similar practical objective was always in Farrer's mind. In the production of Rerraf, Comeback and Federation, Farrer was able to produce varieties that were respectively more rust-resistant, of higher milling quality, and of greater precocity than varieties hitherto grown in Australia.

Flour Strength.

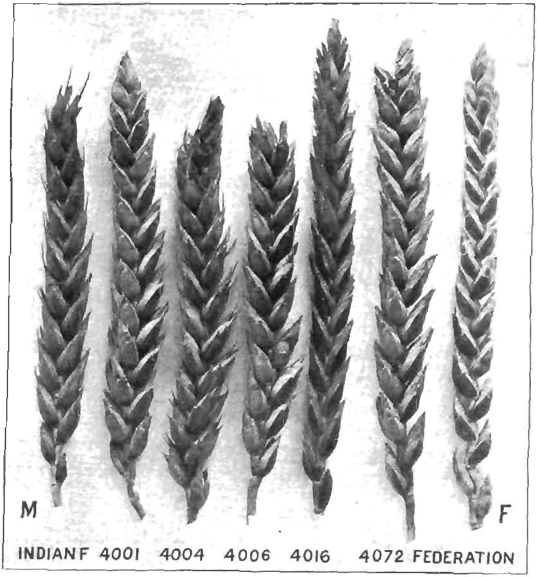
The creation of varieties like Bobs and Comeback is especially interesting, inasmuch as it demonstrates that the production of wheat *of high strength is not, as some suppose, solely dependent on climatic* conditions. What exactly are the factors constituting strength in wheat

Crossbred Wheats at the Rutherglen Experiment Farm.

is not yet definitely known, but much valuable work on the nature of strength in flour has been done by Mr. Guthrie, of Sydney. It was only through collaboration with Mr. Guthrie that Farrer was able to achieve such remarkable success in evolving high strength wheats.

Rust Resistance.

Capacity for resisting rust is certainly a most important quality, but the damage done to Australian wheat crops in the majority of seasons is far less than that in more humid countries. The dry atmosphere characteristic of the wheat belt in Spring and Summer, and the absence of prolonged humid weather at the flowering stages, tend to arrest the development of rust. Occasionally, however, climatic conditions are favorable to its rapid spread, as in 1889, when the estimated



Prolific Crossbred Wheats.

damage to Australian crops was several millions sterling. For this reason the production of immune types became a distinctly practical objective. Biffen has definitely shown that susceptibility and immunity to yellow rust behave as a pair of Mendelian characters, and that the production of immune types from prolific but susceptible forms is practicable. Unfortunately, varieties that are rust-resistant under one set of climatic conditions are frequently found to be susceptible to

rust under another set of conditions, from which it follows that each country must evolve varieties suited to its own conditions.

A good illustration in point is the behaviour of Australian varieties sown in England several years ago. Six representative Australian wheats (Federation, Yandilla King, Comeback, Nhill, Gluyas, and Marshall's No. 3) were forwarded from South Australia for trial in England by Mr. Humphries on behalf of the British Home Grown Wheat Committee. These varieties gave very poor yields when grown in England, and were practically destroyed by rust, though two at least proved very rust resistant in Australia.

The study of the Rust problem in Australia from the genetic point of view is further complicated by the fact that in some seasons Puccinia graminis the species which causes the greatest damage to crops here—is almost entirely absent from the stud plots. Second generation crosses between immune and susceptible types would, under these circumstances, display no obvious segregation, and, as immunity is apparently independent of any discernible morphological characters, the detection of immune and susceptible forms could not be made.

Prolificacy.

Strength of flour and immunity from rust are important characters, but prolificacy is of still greater importance to farmers. In producing the variety known as Federation, Farrer indeed accomplished a triumph. No variety yet grown in Australia has been so extensively cultivated, or given such uniformly excellent returns. Our knowledge of the mode of inheritance of quantitative characters such as precocity is very meagre, but such knowledge as there is appears to indicate that high and low precocity may ultimately be found to segregate in accordance with the Mendelian mode of inheritance. If such definite segregation does take place, then the production of varieties combining prolificacy with strength and rust resistance under Australian conditions becomes possible. The determination of the scheme of inheritance of qualitative characters is relatively easy, that of quantitative characters extremely difficult. For the quantitative characters are the joint expression of internal and external factors—heredity and environment, and in order that the mode of inheritance of precocity in the progeny may not be masked, absolute uniformity in environmental conditions is essential. This latter is in practice difficult to secure, but the adoption of the Centgener Plot system already described, for a study of the Second Generation (F2) Crossbreds, seems to offer the best opportunity for securing equality of environment, and thus throwing into relief the differences due to the internal factors.

To secure absolute equality in the environmental conditions for each individual plant is a matter of considerable difficulty, and even approximate equality is not secured by any of the orthodox methods of sowing the seeds in nursery rows. To eliminate inequalities in soil conditions and to give each plant equal opportunity for development the practice followed at Rutherglen is to sow the plots on the Centgener Chessboard system with a specially constructed planting board arranged in such a way as to enable the seed to be placed at uniform depths under standard conditions of pressure.

The tillage operations for the preparation of such Centgener plots need to be carried out with extreme care on a soil of uniform quality. Even the treading of horses during the process of preparation causes differential consolidation of the seed bed, and this is avoided by drawing the implements with long cables or ropes.

The utilization of a series of such plots for F2 Crossbreds between pure types of high and low precocity will undoubtedly give definite information on the exact mode of inheritance of this important character. Such tests are now being undertaken.

Whilst the crossbreeding of types of high prolificacy might naturally be expected to give high yielding strains, there always exists the possibility of securing types of higher prolificacy than either of the original forms by the re-combination of factors. That is to say, the crossing of types differing only slightly in prolificacy may frequently give rise to a wide range of variation in which new forms appear exceeding the limits of prolificacy hitherto reached.

Drought Resistance.

Whatever may be the factors that together make up the complex of prolificacy, it is certain that the ratio of grain to straw is not the least important. Soil moisture is the limiting factor in Australian wheat-growing. Not only must we conserve all moisture possible by the adoption of moisture saving fallows, but it is also of the highest importance that the hard won moisture should be transpired economically by the crop. But it is just in this capacity for the profitable utilization of soil moisture that our wheat varieties differ very widely.

To produce a ton of dry matter approximately 500 tons of water, *i.e.*, an equivalent of 5 inches of rain, must pass through the tissues of the wheat plant. But in some varieties one ton of ripened produce, *e.g.*, Huguenot, contains considerably less than one-third of its weight as grain, whilst one ton of certain Indian varieties grown at Werribee and Rutherglen under similar conditions contained considerably more than half a ton of grain. Now, on the average Australian farm straw has practically no value. On many farms indeed the stubble is regularly burned. Obviously, if soil moisture is the limiting factor in Australian wheat production it is of the utmost importance that varieties possessing the highest possible ratio of grain to straw should be grown. The search for varieties possessing such high migration ratios is therefore of the utmost practical importance, for it is to these types that we must look for the evolution of prolific drought-resistant strains. Detailed examination of a number of strains of Federation wheat, which may be regarded as one of the most prolific types now grown in Australia, shows that there is a wide range of variation in this important property, and this offers to the breeder a fine opportunity for further improvement by selection and by crossbreeding.

The Migration Ratio.

During the past seven years a large number of crosses of prolific local types and certain introduced varieties have been made and closely studied by the writer. When fixed, these crosses were sown in long rows side by side with standard varieties like Federation, and each year the least prolific types were eliminated. After repeated trials it is

noteworthy that out of a large number of crosses brought under trial, a number of types of high yielding capacity have been isolated, and in nearly all cases the crosses proved to be made from certain Indian varieties on Australian varieties like Federation, Comeback, &c. These Indian types, used as pollinating parents, were in nearly all cases early maturing varieties, remarkably short of stature, with a high ratio of grain to straw, and with spare stooling habits. During the last season several of these new crossbreds (when tried for the first time in small field plots) gave increases over the Federation check plots up to 46 per cent., whilst a number gave yields exceeding those of the parents from which they were derived.

Conclusion.

The work of wheat improvement is in its infancy in Australia, and the striking success achieved by Farrer in the work of evolving new and useful types is extremely encouraging. *Milling quality, disease resistance*, prolificacy, have been imparted to a high degree in different varieties, but the production of a type combining all these qualities yet remains to be done.

The nature of the Australian climate and the fact that the rainfall diminishes as we pass from the coast to the interior makes the study of drought resistance of great importance. With the evolution of drought resistant strains new territory may be subjugated, and the success of existing wheat areas made more assured. The continued testing over as wide and varied a field as possible of approved local and acclimatised foreign types, combined with the systematic breeding from types showing high efficiency in the utilisation of transpired soil moisture as measured by the migration ratio, seems to hold out considerable promise for the production of the requisite hardy types.

PROFITABLE MANURING IN THE NORTH-EAST OF ENGLAND.

At a meeting of the Newcastle Farmers' Club an address on "The Profitable and Practical Side of Manuring" was given by Mr. J. W. Taylor, B.Sc.

Some interesting results were given, the manure used was ammonium sulphate.

In the hay experiments profits of £4 17s. to £5 per acre were secured with dressings of 1 cwt. ammonium sulphate per acre, costing 15s. 6d. per acre. On turnips the increase was nearly 12 tons per acre, representing an additional profit of £13 per acre. The dressing of ammonium sulphate being as before, 1 cwt. per acre. With a dressing of 1½ cwt. of ammonium sulphate per acre, the increase in the potato crop was 4 tons per acre over the unmanured portion, and reprèsenting an additional profit of £12 per acre.

Extract from "Fertilisers."

28th March, 1914.

Ammonium sulphate is not largely used in Victoria, the surplus *supply being exported, mainly to Japan."*

SUMMER FODDER CROPS.

Temple A. J. Smith, Chief Field Officer.

In districts served by irrigation works, or where water can be used by pumping from rivers, creeks, or other water supplies, provision should always be made for the growing of summer fodder crops. There are also many portions of the State which get summer rains, capable of producing fine crops without irrigation, in which it is a fair proposition to take whatever risk there may be in sowing summer fodder crops. The upper reaches of most of our rivers run through flats admirably suited for such crops, while the greater part of Gippsland, the hilly portions of the north-east, and the coastal areas in the west stand a very fair chance of growing summer fodder under the natural rainfall.

Recently, the writer met two farmers in the Western District who were looking for grass for sheep. Both had properties on a fine river, with engines and pumps—one, indeed, had even irrigated 400 acres for grass, but had not thought of using the plough and growing fodder. Both arranged to return home and grow their own feed, one wisely remarking, "We may possibly have more than one droughty season, and can keep on growing stuff while there is no guarantee that there will be grass here." Where such operations are possible, it is surely a better business proposition to spend 20s. an acre to produce a crop on one's own property than to pay the same amount for grazing elsewhere, with the addition of the expense of travelling, &c.

Good cultivation is essential to success, and, where possible, the use of land that has been fallowed, or where a crop has failed owing to scanty rainfall, is advisable. Fairly heavy manurial dressings also prove profitable, especially where irrigation is practised. The general experience is that, after a dry winter and spring, good rains may be expected later in the season, too late for natural grasses, but highly beneficial to summer fodder crops on cultivated land, and there is at least a fair possibility that such may be the case.

There are many crops suitable for the purposes suggested, and it is proposed to deal with several, giving their chief values and characteristics, so that those who contemplate growing summer fodder may choose according to their situations, soils, climates, and other conditions. Lucerne is not dealt with here, as it requires graded land prepared by a fallow, and should not be fed off, but should be cut and fed green after wilting, or made into hay to obtain the fullest returns. A rotation of crops in order to get the earliest possible feed, and after that, later fodder to carry the summer through, should be the objective.

It is not absolutely necessary to have graded land for irrigation, though it is always an advantage in securing a more even distribution of water; but with a canvas hose, and lift-pumps, fairly large areas can be watered and success assured during a dry spell. Small paddocks, however, are essential, as stock should not be put on land being irrigated, and a few weeks' spell to the different crops leads to a greatly increased fodder supply and carrying capacity. Seeding operations under the conditions specified can be followed well into January, though it would be wise to get some crops under way as soon as possible.

EARLY FEED FOR GRAZING.

Millets.

To secure early feed in the first paddocks, there are several varieties of millets which can be cheaply grown, and provide a big body of feed. They are specially suited to the warmer parts of the State, and thrive best on sandy or gravelly soils, though they also give fair results on somewhat heavy land. They are already largely grown about Swan Hill, Kerang, Koondrook, Nyah, and in other northern portions of the State.

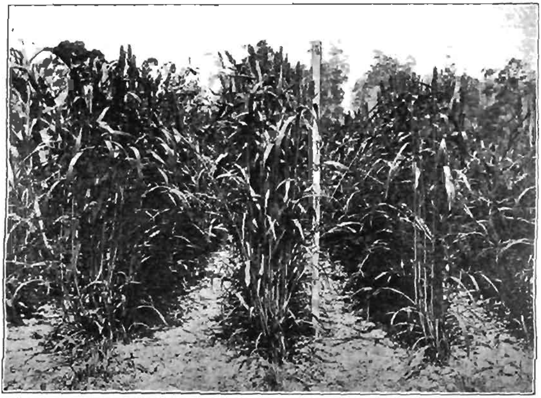
Cultivation.—The land should be worked well, making a fine firm seed bed; lumpy or hollow land is bad. Where the surface soil is shallow, deep ploughing is not advisable. Rolling before seeding is useful, especially on loose open soils. One of the great secrets of success in growing all millets is to sow shallow and when the ground is warm. Seed put down too deep or in cold ground will mould, and only a small proportion will grow. One inch to one and a half inches is deep enough to sow. They can be sown from September to January. If sown broadcast or drilled, they should be every 7 inches apart, and from 9 to 12 pounds of seed per acre should be sown.

Japanese Millet sown broadcast.

Varieties.—The most popular variety is that known as Japanese Millet. This variety comes early, and can be fed off in from four to six weeks after seeding; in fact, where intended for grazing purposes, it should be stocked when about 6 inches high, and fed down fairly close, which will tend to make it stool and become thicker. If necessary, the stock should be taken off, and the water should then be applied. As soon as the land is sufficiently dry to carry a team, the paddock should be harrowed with a set of sharp harrows across the drills, and

the crop allowed to grow to a height of 6 to 10 inches, when the stock can again be put on. Treated in this way, it can be kept growing throughout the summer, and will carry, on an average, about ten to fifteen sheep per acre. The harrowing should be done at least three times during the season, and will be found to materially increase the growth of the crop. At intervals of a fortnight to three weeks, there should be a fine body of feed in each paddock. Three to four paddocks are necessary, for to keep the stock on too long means less actual growth and the tramping out of the millet, whereas the intervals of rest restore the damage done in this way.

Where the Japanese millet is cut and not grazed, it is better sown in drills 15 inches apart, and the scuffler worked between the rows until it is about 3 feet high. It should be cut well before the seeding stage



Japanese Millet drilled in rows 2 ft. 6 in. apart.

about 3 inches from the ground. Cutting too close to the ground is liable to kill some of the plants. Cutting can be done three to four times in the season, and care should always be taken to wilt the millet for a few hours before feeding to stock, especially cows.

Yields of from 12 to 18 tons of green millet per acre are not uncommon, the crop growing in some cases 6 feet high. After the second cutting the crop can, if desired, be left to mature seed, which is readily saleable, and returns a handsome profit per acre. Japanese millet can be cut for hay, and yields up to 3½ tons per acre. It must not, however, be allowed to go too far, as it will become woody and fibrous, and consequently indigestible. If cut just before the flowering stage, it will be all right. As hay, it is not wise to feed to horses alone, as it affects urination in some animals; but, if mixed with oaten hay, it is non-injurious, and gives the chaff a nice green colour.

The crop can be cut with the binder, and the sheaves should be small and loosely tied to allow it to dry without becoming mildewed. It should be stooked in rows, not too thickly, and can then be stacked as oats or wheat sheaves are.

Once established, Japanese millet will take a large amount of water, and will grow in inches of water for weeks at a time. It is not, however, a good system to allow water to lie on the surface more than forty-eight hours, and if fed off, and the surface cultivated, better results follow, and the millet will be hardier.

German Millet or Moho.

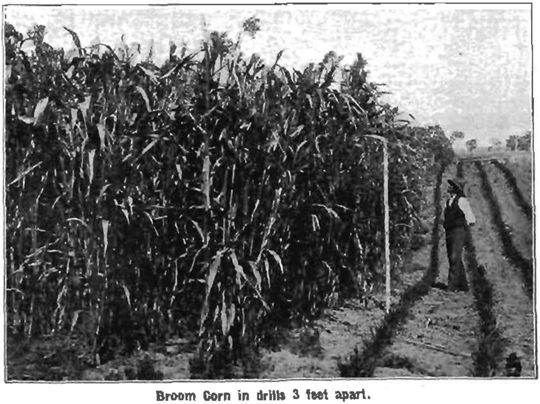
This variety gives a smaller yield and finer straw than Japanese. The seed is smaller, and requires a fine seed bed, and very shallow sowing. Rolling after sowing is desirable. The plant does not stool, but grows a single stem. About 12 lbs. of seed per acre is sufficient, the seed being smaller than most other varieties. It comes early, and makes nice hay being finer than Japanese millet, which is its only superior value.

Sorghum Saccharatum.

This crop is highly suited to warm districts, and gives a fine quantity of feed. It is cheap to seed—about 4 to 5 lbs. per acre being sufficient. It can be fed off in the same manner as Japanese millet, and the same preparation as regards cultivation is necessary. It, however, does not make good hay.

Broom Corn and Russian Millet.

These suit the colder districts, and, though of slightly inferior feeding quality, give large carrying capacity. These may be fed off and kept grazed from the time they are a few inches high. They are, however, dangerous to stock—causing bloat if allowed to grow to a height of



Broom Corn in drills 3 feet apart.

12 inches or more, and especially just before the flowering stage is reached if stock are then turned in. If stock are grazed on these crops from the earliest stages of growth, they are apparently immune. When the seed matures they are safe to feed, and if cut green and wilted before being fed no harm will result.

Fairly large areas have been sown in Gippsland of these millets for grazing sheep, and have been in use for some years. They do not make good hay, but the seed is valuable for fowls, pigs, and winter horse feed.

Red and White Kaffir Corn.

Is chiefly useful, owing to the fact that it will grow on poorer soils than the millets mentioned. It branches from the top, and should be allowed to mature before harvesting. It is best sown in drills 2 ft. 6 in. apart, and should be well cultivated between.

Teosinte, Imphee, or Farmer's Friend.

These sorghums are valuable as late fodders, and can be seeded right up to January. They are slow in maturing, but give a large body of feed in the late autumn. They should be allowed to mature before harvesting or feeding to stock. Some farmers claim that they make better fodder after the first frosts, as the sugar then develops in them. They can be cut and stored in sheaves, which should be placed standing

Good Crop of Imphee.

upright in a shed, from where they can be fed to stock throughout the winter. Three pounds of seed per acre is sufficient, and this should be sown in drills 3 feet apart, and 1 foot to 18 inches in the drill. Cultivation between the rows should be given until the plants are 3 feet high. They grow well with a fair summer rainfall, and yield up to 15 or 20 tons per acre.

Egyptian, Pearl, and Chinese Millets.

These are treated in a similar manner to Japanese millet, though generally sown in drills 15 inches apart. They will stand cutting three times, and give large yields; but have not generally proved so successful as the Japanese variety.

Amber Cane.

Sometimes known as sugar cane, is a sweet sorghum. It was largely grown near Kerang a few years ago, and is still in many places. It has a solid stalk, which on maturing develops a high percentage of sugar, rendering it very palatable to stock. This crop gives very heavy yields up to 25 tons per acre. It should be allowed to mature before stock or cattle are turned in. Its sugar content makes it very fattening, and bullocks can be brought to prime condition upon it. Sheep are not usually put in, but good, sound-mouthed sheep will do well upon it. If fed before maturity, it will blow stock badly, and often causes loss in this way. Good and secure fences are therefore highly necessary for this crop. It will take large quantities of water in the early stages of growth, but should not be irrigated after the flowering stage, as too much water at such periods appears to encourage aphis. The crop ripens about March or April, and makes good feed after frosts, as well as earlier. Relays of sowing are wise in September, November, and December in order to have separate paddocks coming on, and a longer fattening season.

Maize.

This is one of the most useful of fodder crops, giving very high yields, and though not useful for very early feed, makes splendid mid-season and late provision for a plentiful supply. It can be grown on most

Cultivating Maize three weeks from sowing.

freely-drained soils, provided sufficient water is available, but thrives best on rich sandy loams and alluvial flats, with humid conditions of atmosphere and absence of cold winds. Different varieties suit different soils

and climates, and though maize is not as good for early green feed as the millets, by judicious selection, heavy quantities of fodder can be obtained by Christmas.

The crop is better grown for cutting and chaffing when fed to cattle, as if stock are turned into the field when the crop is in the flowering stage, much waste ensues, the cattle often nipping the stalk off half way up the plant, and, after chewing a small portion, dropping the balance on the ground, where it is trodden into the dirt and wasted. Sheep, however, can be grazed on maize without loss in this way, and the right time to turn them into the field is when the maize is in flower, and the cob just forming. Precaution should be taken to put only sound-mouthed sheep in, especially after the first week or two, as broken-mouthed sheep find it difficult to manipulate the stalks. When first turned in, they will eat all the weeds, grass, and lower leaves, and later soon learn to straddle the stalk and eat back from the top to within a foot or two of the ground. Maize 10 to 12 feet high can be consumed.

Cultivating Maize six weeks from sowing.

and a good crop will fatten twenty to twenty-five sheep per acre. Cross-breds, as a rule, are the better class of sheep to use.

To sow maize broadcast for fodder is a mistake, as if sown thickly it soon becomes woody and fibrous, and a larger proportion is wasted, besides that consumed being indigestible and less nutritious. Moreover, maize is liable to disease, and the lower leaves dry off quickly if the crop is dense, and the light and air are not admitted freely to the bottom. Given plenty of room, the stalks, though larger, will be more succulent and easily fed, provided the right varieties are chosen.

The land should be well prepared, fallowed where possible with a view to getting a plentiful supply of nitrogen, and a good seed bed made. Weeds should be worked out of the soil as far as can be done. Maize does not like a cloddy soil. The seed is sown about 3 to 4 inches deep, and a good plan is to plough it in to that depth, the extra working given by the plough loosening the surface and allowing the maize to

come through well. Sown in drills 3 feet apart and in the rows about 9 to 18 inches, dropping two or three seeds in each hill, will be found best. Twenty-four to 28 lbs. of seed will sow an acre.

Yellow and white varieties are the most suitable for fodder purposes. In Gippsland, Yellow Morouya and Hickory King appear to be the favourites, while for the northern parts of the State Eclipse and Silvermine have given most satisfaction. All these varieties are soft in the stem, and grow plenty of leaf, which keeps green late into the autumn. Early varieties are in most cases unsuitable for fodder. After the maize has appeared above the surface, and is 6 to 8 inches high, the harrows should be run over the crop across the rows, and later on the scuffler should be worked between the rows until the maize is 6 feet or 7 feet high;

The same crop twelve weeks after sowing. No rain.

each later working being shallower until the last just skims the surface. This will have the effect of admitting air, supplying nitrogen, conserving moisture, releasing plant foods, and keeping down weeds, all of which processes naturally lead to larger and better crops.

Maize should be sown after the danger of frost is past, as a check to the early growth affects the crop to the end. In the North, September would do for an early crop, which should be fit to feed off by January. Later sowings should be made in separate paddocks in October and November to come in after the first to insure the largest returns. For fodder purposes hilling up is not generally done, and only where winds are liable to blow the stalks over would it be suggested. Where the

soil is not free, and water is likely to leave the soil in a baked condition, *watering between the rows gives best results.* Maize will take a lot of water, but when young will not stand too much.

Rape.

Though rape is usually sown in the autumn, spring seedings are also largely practised, and the month of October is not too late for this crop. The carrying capacity of rape is so well known as to render it almost unnecessary to state cases, but for the benefit of those who have not had experience with this crop it may be mentioned that sheep, to the number of from ten to thirty per acre, can be fattened, according to the size of the crop. Rape does best on free loamy soils of good quality, also on sandy soils well manured; low-lying heavy clay soils are not suitable, nor are badly drained soils of any kind.

The land is better for an autumn fallow, and in all cases cultivation must be thorough. Rape seed is small, and requires a fine seed bed.

Rape, 18½ tons per acre.

It should be sown shallow—half-an-inch is deep enough, but in loose soils 1 inch is the greatest depth allowable to obtain a maximum germination. The heavier and stiffer the soil the shallower should the seeding be. Four to six pounds of seed per acre is the usual allowance, and the most popular variety is the Dwarf Essex, which is specially recommended for spring sowings. Many growers broadcast the seed on the surface, then brush harrow and fallow with a plain heavy roller to compact the ground round the fine seed. Being a deep rooting plant, rape will stand a dry spell better than many other crops.

The crop should be allowed to get well up before being fed off, say a foot or more in height, but stock should always be turned in before the flowering stage, when it can be fed down fairly closely, and should then be given a spell to enable a fresh growth to take place. Sheep

are liable to scour when fed on rape only, and it is a good plan to sow 1 lb. of white mustard seed per acre with the rape to assist in counteracting this trouble.

A grass paddock, to which the sheep may have access at the same time that they are run on the rape, is of great advantage. Care must be taken in putting hungry sheep on to rape well grown, as they are liable to get blown. The best system is to run the sheep through the rape when the dew is off and the sun has been on the crop a few hours. They should not be permitted to have more than ten minutes to a quarter of an hour the first day, a few minutes longer the second day, and after that they will generally be found to suffer very little, though some cases will occur at any time.

Rape seed should never be more than two years old, otherwise germination will be poor.

Rape is a recognised valuable rotation crop, leaving the ground in better condition for the crop to follow than was previously the case. Though not a legume, it leaves sufficient nitrogen (54 lbs. per acre) available for a 35-bushel crop of wheat; enough phosphoric acid (26 lbs.) for the same amount, a fair supply of potash, and a large amount of humus in the shape of decaying root matter. When sown in the autumn with rye the two crops combined have a particularly good effect as a rotation, and where sown on sandy soils, which must be well manured for the purpose of forcing as much growth as possible, they have a greatly beneficial effect if ploughed under in the spring, when the crop is about 10 inches high. Managed in this way they can be fed off all the winter and a handsome profit made from the stock; a green fallow instead of a bare fallow has been given the land, and the crop that follows is in most cases better than where bare fallowing is practised. This system is most applicable to districts with a 20 to 30 inch rainfall.

MANURES FOR SUMMER FODDERS.

Much depends upon the soil and climate under which the crops are grown as to the kinds and qualities of manures required but there can be no doubt that it is a mistaken business policy not to manure for fodders even on fairly rich soils, and it is absolutely imperative on poor soils. The greater the growth of fodder the greater the amount of stock that can be turned off per acre, and the better the land will be for succeeding crops.

For millet and maize crops, in the colder and heavier rainfall districts, from 1 to 2 cwt. of superphosphate per acre, according to the quality of the land used, is advisable. For coastal country a mixture of two-thirds superphosphate with one-third Thomas' phosphate has proved good. Half and half mixtures of super. and bone dust suit sandy soils. Nitrogenous manures are of use in Gippsland and other cool climates, and blood manure—from ½ cwt. to 1 cwt. applications—are good, applied either three weeks before the crop is sown or at the same time. Sulphate of ammonia in 1 cwt. quantities is also good on sandy soils, put on just before or when the seed is sown. Where nitrate of soda is used it should be applied in ½ cwt. to 1 cwt. quantities after the crop has appeared above the surface. Gypsum in soils deficient in lime has proved a benefit to millets, particularly in 5 cwt. dressings,

but the effect is not felt so much the first year as in the following seasons. For northern soils, where lime is plentiful naturally, superphosphate alone is sufficient. Wherever farmyard manure is obtainable it will be found of great value, but it must be in a well rotted condition, and is better not applied in too great quantity, from twenty to thirty loads per acre being sufficient when well worked into the ground. For rape, bonedust appears to have special value, and half and half mixtures of bone and super will be found beneficial.

SUMMARY.

There are several points that will bear emphasizing in regard to the successful growth of fodder in such a season as the present. The first is thorough cultivation, which is absolutely necessary to secure good results, and which will repay any extra work involved; a fine firm seed bed is essential, giving a better condition for the root system to penetrate quickly and easily, providing as it does a larger feeding area and greater supply of plant foods. Better water storage is also secured in this way, and subsequent cultivation made easier and more effective.

Secondly, a suitable system of rotation by which the earliest fodder can be obtained, followed by further supplies to enable the system to extend over the longest possible period, thus maintaining the greatest carrying capacity and the largest profits. This can be done by growing Japanese millet in the first paddocks, and having relays of maize, rape, or sorghum to come in as the millet becomes exhausted; then such crops as teosinte, amber cane, or imphee for late summer feed should carry stock on until the early crops are ready to feed off or rape and rye have reached the useful stage.

Thirdly, subdivided paddocks allow of far greater carrying possibilities than with one field of their combined area. The change from one paddock to another in which there is fresh untrampled feed acts as a stimulant to stock to eat more, and the rest given the previously stocked paddock enables the growth of the crop to recover, the leaf and stem of the plants receiving time to make a fair leaf surface area occasionally to take in from the atmosphere the 93½ per cent. of nourishment it derives from that source. The surest way to kill any crop is to keep it fed down with no chance to breath through its leaf system. This explains the great necessity for allowing lucerne to reach a certain growth for cutting in preference to grazing. Three to five paddocks are generally sufficient, but more would be advantageous as the more constant the change the stock get in reason the better they and the crops thrive.

Fourthly, a proper system of manuring is only a profitable business proposition. To take out of the soil more than is returned to it must result in impoverishing the land sooner or later, and is equivalent to living on one's capital. One cwt. of superphosphate supplies only sufficient phosphoric acid for a 28-bushel crop of wheat, consequently at least that amount should be applied to enable the soil to produce that amount and not suffer ultimately. Even on a fairly rich soil it will pay to keep up the standard of fertility rather than let it diminish, and on poorer soils it is imperative in order to give the land an opportunity to produce good crops.

Where it is known that lime is deficient, applications of burnt lime, ground limestone, or gypsum are also necessary, and for millets in such soils the effect of gypsum has been noticed. Nitrogen can be supplied by fallowing and rotation cropping, using legumes, but it is often wise to use nitrogenous fertilizers where fallowing and rotation cropping has not been possible.

It is curious that a man will pay £5 per acre for grazing land that will carry a sheep per acre, and yet will not spend 5s. per acre on the same land which will often increase the carrying capacity 100 per cent. Every one knows that in many cases crops can be grown with judicious cultivation and fertilization that will carry on the same land five to ten times the number of stock, and the cost of seed and working of the land will be only 20s. to 30s. per acre. In other words, the land that cost £5 in its natural state has been made worth £25 in its carrying capacity for an additional 30s. per acre, and is being improved at the same time.

Stock.

There is something to be said in regard to the class of stock to be purchased. The lowest priced animal is not always the cheapest. Old sheep, for instance, take longer to fatten and do so irregularly, consequently it is more difficult to get a uniform line for market. Very young sheep, also, must have the best of fodder and take more out of the ground than mature sheep. They are, however, always growing into money, and carry the best wool. Six and eight tooth sheep fatten quickly and evenly, carry fine fleeces, and can eat and digest feed that old broken-mouthed and young sheep find difficulty with. Where old sheep have loose teeth or odd long teeth, these should be pulled out, and they will thrive better. Buy good constitutioned sheep of good ages and the fodder will do the rest.

Oats and Vetches.

While oats can hardly be looked upon as a summer fodder, there are several places along the coast where they are sown as late as December and yield good crops. Mixed with vetches a fine body of feed can be grown in such places. The Tartarian variety is best for this purpose, and heavy seeding up to 3 bushels per acre should be used with 5 lbs. of golden vetch seed. The black or hairy vetch is not advisable, as it is liable to become a pest in some districts. This crop can be fed off when 7 to 8 inches high, and will carry five to ten sheep per acre.

MILLING AND BAKING QUALITIES OF VICTORIAN WHEATS.

A. E. V. Richardson, M.A., B.Sc., P. R. Scott, and F. G. B. Winslow.

II.*

In a previous article attention was directed to the difference in the f.a.q. samples of the four wheat States of the Commonwealth. These were composite samples obtained by grouping together representative wheats grown in all parts of the State. We may now consider the milling and baking qualities of individual varieties grown—

(1) Under the same soil and climatic conditions, and

(2) Under differing soil and climatic conditions.

For this purpose we may consider the differences in typical varieties grown at Rutherglen and Longerenong. At these centres the scheme for wheat improvement includes quantitative tests of a large number of varieties of Australian and imported wheats.

The main interest of a wheat to a farmer is, of course, that it should be prolific—for upon its capacity to yield well depends its money making value. The miller, on the other hand, is specially interested in the quality of the wheat, its capacity of yielding a high percentage of flour of suitable colour. The baker is naturally concerned with the bread-making qualities of the flour, for to him the most valuable type will be that which yields the greatest number of well risen, standard loaves per sack of flour. One aim of the wheat breeder is to combine in one variety of wheat the apparently antithetical attributes of prolificacy, and high milling and baking quality, and thus harmonize the somewhat conflicting objectives of the farmer, the miller, and the baker.

The testing of varieties for prolificacy may be readily carried out by means of small field plots, among which are interspersed numbers of check plots of some standard variety like Federation. The testing of the milling and baking qualities is effected by means of the experimental flour mill and the baking oven.

By the combination of the field and laboratory work it is thus possible to determine how far prolificacy and milling quality are combined in the different varieties.

In addition to these standard Australian and imported varieties, a number of new crossbred wheats raised by Mr. H. Pye, of Dookie Agricultural College, were tested. These latter comprise a selection from a large number of crosses undergoing field trials at Dookie, and were chosen for further testing on account of their superior performance in the field plots. That is to say, they have proved prolific in small plots, and it is desired to make final selections according to their milling qualities.

The Rutherglen Wheats.

Twenty-eight varieties were tested in the field and in the laboratory. Of these, American 8, Minnesota 163, and White Fife are imported

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wheats, two (Commonwealth and Currawa) are new crossbreds raised by Mr. Pye, of Dookie College, whilst the remainder are fairly well known to the wheat growers of the Commonwealth. During 1912, whilst growing in the "Acclimatisation Plots," Minnesota 163, White Fife and American 8 gave promise of developing into good useful varieties, and they were, therefore, given a trial on the larger "Selection Plots." The long period of growth of the two former varieties proved detrimental to them in 1913, as is evidenced by their comparative low returns. American 8, however, did better, and is being tried on a larger scale. These varieties would doubtless do much better in the cooler and moister districts where the growing period is more extended.

The following table gives a summary of the field tests and the quality of the grain and flour.

TABLE I.

TESTS OF RUTHERGLEN WHEATS—HARVEST 1913-14.

Name of Wheat.	Yield of Variety in Field Plots.		Bushel Weight of Harvested Sample.	Protein Content of Wheat.	Flour Yield.	Strength of Flour. (Water Absorption Capacity.)	Gluten Content of Flour.		Nitrogen Content of Flour.	Crude Protein in Flour.	Colour of Flour.
							Wet.	Dry.			
	Bush.	lbs.	lbs.	%	%	Quarts per sack.*	%	%	%	%	
American 8 ..	34	26	65·9	12·31	72·3	44	32·02	10·12	1·69	10·56	18
Bayab	30	53	66·2	10 75	72·6	43·5	27·88	8·22	1·46	9·12	20
Bobs	23	37	64·9	11 56	74·6	52 6	28·54	9·72	1·61	10·06	16
Bunyip	29	21	65·5	12·94	72·3	47·0	30·43	9·98	1·72	10·75	19
Cleveland	29	43	62·5	11·00	72·8	45·8	31·65	9·68	1·57	9·81	20
College Eclipse ..	37	31	66·3	11·87	72·5	45·3	32·05	10·47	1·75	10·94	16
Commonwealth ..	30	18	62·3	10·69	71·1	43·0	24·36	8·05	1·54	9·62	20
Currawa	30	35	64·6	11·62	71 8	44·0	29·5	8·72	1·58	9·87	20
Dart's Imperial ..	29	40	65·5	11·21	72·7	43·6	29·5	9·11	1·64	10·25	20
Federation (bulk) ..	34	0	63·9	9·19	72·2	43·4	25·5	8·36	1·36	8·50	20
Federation (selected)	36	32	64·1	9·62	73·0	43·8	24·6	8·05	1·36	8·50	20
Firbank	23	47	65·6	13·50	73·0	44·6	34·27	10·67	1·87	11·69	20
Gamma	27	32	62·6	10·94	71·1	44·0	32·47	9·37	1·57	9·81	19
Genoa	26	48	64·1	12·62	72·8	46·0	32·6	10·5	1·87	11·69	18
Gluyas	29	26	64·2	10·94	73·1	43·6	30·17	9 23	1·65	10·31	20
Huguenot	24	33	64·0	13·50	72·3	50·0	39·43	13·14	2·00	12·50	10
Jonathan	24	25	65·5	11·44	71·7	51·2	29·40	10·54	1·72	10·75	20
King's Early ..	36	7	65·9	12·25	70·3	42·2	34·4	10·58	1·88	11·75	20
Marshall's No. 3 ..	31	21	63·8	10·75	73·0	44·4	29·4	9·24	1·55	9·69	20
Minnesota 163 ..	20	28	61·8	13·63	73·7	44·5	38·47	12·71	2·07	12·93	18
Purple Straw ..	26	8	63·9	11·81	72·8	45·4	28·98	8·98	1·78	11·13	20
Thew	28	40	64·7	13·63	73·9	50·0	34·82	11·53	1·98	12·37	18
Triumph	32	18	65·5	11·62	73·8	45·0	30·0	8·66	1·54	9·62	20
Viking	31	32	65·9	10·56	72·9	43·8	27·42	8·48	1·44	·900	18
Warren	29	8	64·1	12·75	71·6	49·6	28·71	9·64	1·87	11·68	20
White Fife ..	22	46	65·2	11·81	75·5	50·4	32·09	11·17	1·74	10·87	16
White Tuscan ..	28	21	64·6	12·19	72·8	44·8	33·33	10·42	1·86	11·62	18
Yandilla King ..	35	22	64·9	11·56	74·0	46·8	29·1	9·10	1·77	11·05	20
Zealand Blue ..	30	0	64·1	12·12	74·8	49·4	28·58	10·21	1·79	11·19	20

* 200 lbs. flour.

A survey of the table brings out forcibly the wide differences in the yielding qualities of the different varieties under precisely similar soil and climatic conditions as well as the wide variations that exist in the quality of the grain. So far as prolificacy is concerned, it will be noted that the yield, when sown under precisely similar conditions, varied from 20 bushels 28 lbs. per acre in the case of Minnesota 163, up to 37 bushels 31 lbs. per acre in the case of College Eclipse.

Great variation is shown in the quality of the wheat, and it is a matter for regret to note that almost without exception those varieties which have put up good performances in the field, are varieties which have given indifferent results in the mill and the bake-house, whilst certain varieties giving high strengths such as Bobs, Jonathan and White Fife, or high gluten content and good baking quality such as Minnesota 163, have given disappointing results in the field.

The range of water-absorption capacity of the flours, which in a measure is proportionate to the bread-making capacity, ranges from a minimum of 42.3 quarts per sack with King's Early, to 52.6 quarts per sack with Bobs. Bobs, Jonathan, White Fife, Thew and Zealand Blue are well up on the list for strength, whilst Federation, Bayah, Gluyas, King's Early, Viking, and Dart's Imperial, which are very popular with farmers, are near the bottom of the list.

The gluten percentage shows even greater relative variations, ranging from 8.05 per cent. in the case of Commonwealth and Federation, to 12.71 per cent. in Minnesota 163, and 13.14 per cent. in the case of Huguenot. The gluten is determined by the washing process described in previous articles.

Closely connected with the gluten content is the nitrogen and total protein of the flour. The percentage of nitrogen is, of course, determined by the well-known Kjeldahl process, and the crude protein is deduced by multiplying the nitrogen content by 6.25. The gluten content appears to run parallel with the total protein in the flour. It is not really so, however, since the amount of proteids other than gluten varies with the different varieties. Closer examination, therefore, will reveal the fact that some varieties, *e.g.*, Purple Straw, Yandilla King, have a considerable quantity of nitrogen other than proteid present in the flour.

Longerenong Wheats.

The results of the tests with Longerenong wheats are summarized in Table II. On reviewing the results we find that one point stands out prominently; while there are again the same wide variations in prolificacy and milling quality among the different varieties we find that the types that were strongest at Rutherglen were also the strongest at Longerenong. Also the varieties with the highest gluten and protein content at Rutherglen were the varieties with the highest protein content at Longerenong. In other words, quality in wheat, though undoubtedly influenced by soil and climate, is essentially a fixed and inherent characteristic of the variety. And on this fundamental fact the work of the wheat breeder in his search for prolific, high quality types rests.

TABLE II.

TESTS OF LONGERENONG WHEATS. HARVEST 1913-14.

Name of Wheat.	Yield of Variety in Field Plots.		Bushel Weight of Harvested Sample.	Protein Content of Wheat.	Flour Yield.	Strength of Flour. (Water Absorption Capacity.)	Gluten Content of Flour.		Nitrogen Content of Flour.	Crude Protein in Flour.	Colour of Flour.
							Wet.	Dry.			
	Bush.	lbs.	lbs.	%	%	Quarts per sack.*	%	%	%	%	
American 8 ..	17	30	65·1	13·69	70·1	43·4	32·5	10·71	1·97	12·31	19
Bayah	23	24	64·0	11·87	71·6	43·3	22·93	7·5	1·76	11·00	19
Bobs	..	..	61·5	12·75	74·7	52·3	30·15	10·3	1·85	11·56	15
Bunyip	27	36	63·5	11·81	73·5	47·5	28·9	9·96	1·75	10·94	19
College Eclipse ..	30	6	61·5	12·19	72·0	48·0	32·8	11·28	1·86	10·62	16
Commonwealth ..	..	..	61·0	10·69	69·1	43·6	27·6	9·05	1·61	10·06	18
Currawa	..	..	62·7	11·75	70·5	42·6	30·92	9·45	1·75	10·94	16
Dart's Imperial ..	17	24	63·5	13·62	70·2	46·3	34·25	10·57	1·96	12·25	19
Federation (bulk) ..	25	12	62·0	11·31	70·5	44·4	27·85	9·40	1·64	10·25	18
Federation (selected)	36	29	62·7	10·50	71·0	45·0	25·70	8·72	1·58	9·87	18
Firbank	22	42	61·5	12·75	71·4	46·0	33·2	10·73	1·83	11·44	17
Gluyas	21	0	61·0	12·06	70·9	43·0	32·59	10·18	1·78	11·13	16
Huguenot	16	52	60·0	16·31	72·0	49·5	47·75	16·00	2·41	15·06	11
King's Early ..	22	36	62·5	12·69	70·1	42·0	34·16	10·28	1·90	11·87	16
Marshall's No. 3 ..	17	30	61·5	12·06	72·0	44·0	28·05	8·60	1·80	11·25	20
Moira	..	..	62·0	11·44	71·3	42·8	31·27	9·31	1·63	10·19	19
Viking	27	18	63·3	11·44	70·0	42·6	27·70	8·20	1·54	9·62	17
Warren	..	..	62·5	11·62	72·0	47·2	28·62	9·85	1·68	10·50	19
Yandilla King ..	23	24	62·5	11·81	73·6	45·0	34·54	10·84	1·75	10·94	19
Zealand Blue ..	..	..	63·0	13·56	73·1	47·0	34·40	11·87	1·96	12·25	20

* 200 lbs. Flour.

It is also to be noted that while, on the whole, the same relative order is observed as regards strength and gluten content with the eighteen varieties tested at both centres, the limits of variation are greater at Longerenong than at Rutherglen. Thus, the protein content of the kernel varies from 10.50 per cent. with Federation to 16.31 per cent. in the case of Huguenot, whilst the range in protein for the corresponding Rutherglen wheats was 9.19 per cent. to 13.50 per cent.

Similarly, with regard to gluten content of the flour the Longerenong wheats showed a variation of 7.51 per cent. with Bayah to 16 per cent. in the case of Huguenot, the corresponding range at Rutherglen being from 8.22 per cent. to 13.14 per cent.

Comparing the averages of the varieties grown at both centres it is interesting to note that the Rutherglen wheats are a trifle stronger than the Longerenong wheats, but they have a considerably lower gluten content.

Of these various varieties, Bobs stands out prominently as a high strength wheat of good milling quality. It absorbs and retains a large amount of water used in conditioning, readily gives a large percentage

of high grade flour suitable for baking either by itself or blending with other varieties of lower strength. The flour made from this variety is worth considerably more per ton than the ordinary straight grade flour. The bread obtained in baking the flour has an excellent colour, texture, pile, and volume. The bran, however, is thin, and does not compare favorably with the bran obtained from the soft wheats. It will be observed that at Rutherglen and Longerenong it is a shy yielder, and will not prove a profitable variety for a farmer to grow unless sufficient inducement in the shape of increased price per bushel is forthcoming from the miller.

Comeback is an excellent variety for blending with medium or low strength wheats. When baked by itself Comeback flour is very hard to work, and gives a somewhat squatty loaf. Mixed or blended with low strength flours, however, it gives excellent results.

Genoa, Thew, Warren, and Zealand Blue are medium strength wheats of good milling and baking quality, giving flour of excellent colour.

White Fife, though strong and glutinous in character and milling freely, gives a flour of indifferent colour.

Bunyip, Cleveland, College Eclipse, Triumph, and Yandilla King have fair strength, and their milling and baking qualities are satisfactory, and are especially suitable for blending with high strength wheats.

Commonwealth, Currawa, White Tuscan, and Firbank are low strength wheats, but the colour of the flour is good and the elasticity of their gluten makes them suitable for blending with wheat of high strength.

Bayah, Dart's Imperial, Federation, King's Early, Gluyas, Gamma, and Viking were below the results of the f.a.q. standard sample.

American 8 gave rather poor results both in the mill and the oven, whilst Huguenot, though possessing high strength and gluten content, has a most objectionable colour, and is therefore unsuitable for bread-making. The majority of the wheats tested, and practically the whole of the Australian varieties, produced a flour of excellent colour. Herein lies the great advantage of the Australian wheats to the British miller. The British miller has a unique opportunity for the production, by appropriate blending, of a flour of uniform colour, high strength, and gluten content. He is able to draw on the whole world for his supplies of wheat, and finds the Australian wheats of great value for the production of flour of good colour, and for blending with the strong, glutinous but darker wheats of Manitoba and Southern Russia.

Of the varieties described above, nine have been tested at each centre for two years. A comparison of the two sets of results would, therefore, give an indication of the general effect of the season on the quality of the wheat. The most reliable indicator of the seasonal conditions is the nitrogen and protein content of the wheat and flour, for this is more dependent on seasonal conditions than any other quality in the wheat. Rapid ripening of the kernel generally leads to high nitrogen and protein content. When, however, the ripening period is protracted, through cool weather, abundant moisture in the soil, &c., the kernel is usually rich in starch and carbohydrates and correspondingly low in gluten and nitrogen content. The climatic conditions of

these two centres, however, are so similar that the effect of the season on the quality of the grain is to a large extent masked. The differences due to climatic factors would be better illustrated by comparing similar varieties grown, say, at Gippsland, the North-West Mallee, the Western and Northern District. We hope to be in a position to effect such comparisons during the forthcoming harvest.

Table III. gives the protein content of the wheat of the 1913 and 1914 harvest at Rutherglen and Longerenong.

TABLE III.

PROTEIN CONTENT OF WHEATS—RUTHERGLEN AND LONGERENONG, 1912 AND 1913.

	Rutherglen.		Longerenong.	
	1912-13.	1913-14	1912-13.	1913-14.
	%	%	%	%
American 8	12·50	12·31	12·56	13·69
Bayah	12·44	10·75	12·18	11·87
Dart's Imperial	10·62	11·21	12·94	13·62
Federation	11·62	9·19	11·62	11·31
Gluyas	11·37	10·94	11·44	12·06
Huguenot	12·24	13·50	14·80	16·31
King's Early	14·00	12·25	13·81	12·69
Marshall's No. 3	10·31	10·75	11·56	12·06
Zealand Blue	10·93	12·12	14·25	13·56
Average	11·78	11·44	12·79	13·02

It will be noted that in each season the average protein content of the Longerenong wheats was considerably higher than those of Rutherglen, being 1 per cent. higher in 1912, and 1.58 per cent. higher in 1913. It is difficult to say how far these differences in the composition of similar varieties are dependent on the climatic, or on the soil conditions. Monthly examinations of the soil at both centres in connexion with other experimental work reveals the interesting fact that throughout the whole period of growth the process of nitrification is far more active at Longerenong than at Rutherglen, and that the amount of available nitrogen present at any given stage is always greater at Longerenong than at Rutherglen. Thus throughout the growing period of the crop the average amount of nitrate nitrogen in the first two feet of Longerenong fallow was 12.01 parts per million, as against a content of 6.68 parts per million in the Rutherglen soil.

Similar differences may be observed in the percentages of dry gluten and protein in the flour as have been already noted in the wheat kernel. With regard to water absorption capacity of the flour, the Rutherglen flours have given slightly higher results than the Longerenong flours. These differences are summarized in Table IV.

TABLE IV.

SHOWING AVERAGE STRENGTH AND GLUTEN CONTENT OF FLOUR FROM NINE TYPICAL VARIETIES OF WHEAT GROWN FOR TWO YEARS AT RUTHERGLEN AND LONGERENONG.

—	Strength.	Dry Gluten.	Crude Protein.	
			Flour.	Wheat.
		%	%	%
1913–14 Harvest—				
Rutherglen	44·9	9·80	10·43	11·45
Longerenong	44·7	10·57	11·93	13·02
1912–13 Harvest—				
Rutherglen	44·4	7·96	10·79	11·78
Longerenong	44·3	10·42	11·72	12·79

Crossbreds from Dookie Agricultural College.

A number of new crossbred wheats, produced by Mr. H. Pye, Dookie College, were tested. These crosses have done well in small field plots, and several of them will doubtless find their way into general cultivation as a result of further field tests.

Samples of Bunyip, Comeback A, and Warden, from Dookie, were also milled. The results are summarized in Table V.

TABLE V.

MILLING TESTS OF NEW CROSSBREDS FROM DOOKIE COLLEGE.

Milling No.	Kind.	Strength.	Flour.				Wheat.	
			Wet Gluten.	Dry Gluten.	Nitrogen.	Proteids.	Nitrogen.	Proteids.
		Quarts.	%	%	%	%	%	%
230	Bunyip	44·3	27·24	9·41	1·60	10·00	1·71	10·69
231	Comeback A ..	52·0	25·82	9·10	1·68	10·50	1·83	11·44
232	R.3530	47·0	26·36	9·30	1·73	10·81	1·97	12·31
233	R.4100	43·0	30·50	9·27	1·58	9·87	1·65	10·31
234	R.4179	42·0	25·90	8·12	1·41	8·81	1·54	9·62
235	R.4180	42·0	21·88	6·90	1·36	8·50	1·57	9·81
236	R.4189	42·8	23·13	6·81	1·51	9·44	1·75	10·94
243	R.4426	41·6	32·30	9·62	1·66	10·37	1·82	11·37
238	Q.3689	41·0	21·56	6·82	1·20	7·50	1·40	8·75
237	Q.3979	42·0	29·00	8·60	1·47	9·19	1·55	9·69
239	Q.3981	41·8	23·12	7·20	1·26	7·87	1·40	8·75
242	Q.3982	43·4	28·90	9·03	1·55	9·68	1·69	10·56
240	Q.4697	41·4	20·00	6·37	1·06	6·62	1·31	8·19
241	Warden	42·0	23·56	7·40	1·26	7·87	1·46	9·12
..	*F. A. Q. Sample* ..	45·6	26·26	8·51	1·48	9·25	1·79	11·19

It will be noted that there is a considerable range of variation in strength, gluten and protein content of these crosses. It would appear that the seasonal conditions experienced at Dookie last year were not particularly favorable for the development of high *strength* and gluten

content. Thus, Bunyip grown at Dookie, gave a strength of 44.3 and a protein content in the grain of 10.69 per cent. At Longerenong and Rutherglen the corresponding figures were 47.5 and 11.81 per cent., and 47.0 and 12.94 per cent. respectively. In view of this the performance of the new cross R.3530 is very satisfactory. It has a strength of 47.0, a proteid content of 12.31 per cent., and a gluten content of 9.30 per cent. With satisfactory tests in the field, it should prove a useful and valuable variety. Q.3982 and R.4100 have given good results in the mill and the oven. The remaining wheats, however, would require to be heavy yielders to completely justify their further exploitation.

Summary.

1. Twenty-eight varieties of wheat and twelve new crossbreds from Dookie College were submitted to milling and baking tests.

2. Wide variations in prolificacy, bushel weight, strength and colour of flour, gluten, nitrogen and protein content were observed.

3. Almost without exception the varieties of highest milling quality gave the poorest yields in the field, and, conversely, the most prolific and commonly grown wheats gave relatively poor results in the mill and the bake-house.

4. Climate or seasonal conditions and soil undoubtedly play an important part in determining the quality of the grain, but it is noteworthy that the same varieties showed the same relative differences at the centres tested.

5. Quality in wheat is therefore a fixed and inherent characteristic of the variety.

6. Varieties grown at Longerenong were slightly lower in strength, but considerably higher in protein and gluten than the same varieties grown at Rutherglen.

7. This increased protein content is probably accounted for by the higher nitrate content of Longerenong soils throughout the whole period of growth—due to the greater vigor of the nitrifying soil organisms.

8. Bobs, Jonathan and Comeback gave flour of high strength, and are most valuable varieties for blending.

9. Genoa, Thew, Warren, and Zealand Blue were found to be of medium strength and good milling quality.

10. Bunyip, Cleveland, College Eclipse, Triumph and Yandilla King have fair strength, and their milling and baking qualities are satisfactory.

11. Bayah, Dart's Imperial, King's Early, Federation, Gamma and Viking are low strength varieties, and were below the f.a.q. standard.

12. The majority of the Australian types produced flour of excellent colour, contrasting strongly with such durum wheats as Huguenot, and introduced types such as White Fife, Minnesota, American 8.

13. Comparing the wheats of 1913 with those of previous year, the 1913 wheats show a considerable increase in the protein content of the wheat, and the total protein and gluten of the flour, but a slight decrease in strength.

14. Several of the new crossbreds from Dookie College tested show considerable promise.

15. The production of a variety combining prolificacy with milling quality is the most important task ahead of Australian wheat breeding.

SECOND ANNUAL FARMERS' FIELD DAY

AT THE

CENTRAL RESEARCH FARM, WERRIBEE.

25TH SEPTEMBER, 1914.

The Second Annual Field Day at the Central Research Farm, Werribee, was held on Friday, 25th September, 1914, when about 250 farmers were present in response to the invitation of the Hon. the Minister of Agriculture.

The Minister of Agriculture (The Hon. W. Hutchinson, M.L.A.), in welcoming the visitors at the entrance to the farm, said he was glad to see such a large number of farmers present despite the threatening weather in the city during the morning. They were all sorry that the dampness that threatened had not continued. However, they were hoping that some of the rain had penetrated to the northern parts of the State where it was so badly needed.

Mr. Richardson, the Agricultural Superintendent, would take charge of the visitors, and would explain from point to point the work being carried out on the farm.

Early in August he had had the pleasure of welcoming to the Farm representatives of the British Association for the Advancement of Science. In their Agricultural Section there were some of the leading and most representative scientists in the old world. They spent an afternoon on the farm, and, after thoroughly exploring the whole place, Professor Hall, one of the members of the Agricultural Commission appointed by the Imperial Government, and formerly director of the Rothamstead Experiment Station, famed throughout the world for the work done in agricultural experiments and science, expressed his admiration and wonder at the work done on this "baby" experiment station, which was only two years old. The Werribee Farm could not show the work accomplished by the older experimental stations of the world, but it showed the design the Department had in view and the work being carried out. It would be seen that on this farm many of the difficulties which the agriculturists of Victoria had to face were being tackled scientifically. The ordinary farmer could not afford to carry out costly experiments. The Government recognised that it was the duty of the State to conduct these experiments, and he considered those present would find that they were being intelligently and capably tackled on this farm. He invited the visitors to carefully inspect the work going on, and the Department would welcome the farmers' criticism on the work.

With regard to the present great national crisis, they were all glad to be not only Australians but Britishers. (Hear, hear.) He was very pleased to welcome that day the Australian Consul-General for the Netherlands (Mr. W. L. Bosschart) and the Australian Consul-General for Italy (Cavaliere E. Eles). (Applause.)

The present crisis presented itself to them in two ways, first, the Empire at war. They were pledged to that war and to the successful issue of that war right up to the hilt. Most of those present had that

morning watched the march of the Victorian quota of the first Australian expeditionary force called to fight for the Empire. The troops had, in a very short space of time, been transformed almost into an army of veterans. As they marched along the Melbourne streets that morning they had given the people a great thrill of pride and a satisfactory feeling that they would worthily represent Australia on any battle-field they were called to play a part on. (Hear, hear.)

The second matter to which he wished to direct attention was the threatened drought, whose ugly head was hanging not only over Victoria but over the great part of Australia. It was as true to-day as ever it was that the "darkest hour was before the dawn." Past experience had shown that a very bad season was invariably followed by an exceptionally good one. In the Northern areas many thousands of acres would not bear crop this year. Under normal conditions that land would not be sown again until fallowed. Normally, the only crop put

Water Supply and Farmstead.

in next season would be on land that was under fallow this year. What we wished to point out was that the thousands of acres referred to which would only have a very stunted crop this year would be almost the same as fallow land, and should be sown again next season. He, therefore, wished to appeal to the farmers throughout the State to crop not only their fallow land but also the stunted crop land.

Following the drought of 1902 there had been a most bountiful crop in 1903, and, by increasing the area under crop next year, the farmers would recompense themselves for the losses of this year.

The Nations at present at war produced more than one-third of the whole of the wheat crop of the world. One could understand that in this war, which unfortunately must be a protracted one, the agricultural industries would be completely disorganized. Therefore, the world's need must be supplied—particularly our Nation's need—by Canada, Argentina, and Australia. This was Australia's opportunity to grow a great crop next season.

Mr. A. E. V. Richardson said, before the inspection began, that the average rainfall of the district, as indicated by the records of the township of Werribee, was 20½ inches, but during the last two years the rainfall had been short. Last year only 16½ inches of rain had fallen in the district, and, for the first nine months of the present year, the rainfall had been barely 8 inches—less than half of the average for the whole year. If they could only be sure of a 20½-inch rainfall every year it would be satisfactory. Again, the rainfall at Werribee was not so effective as in other parts of the State owing to the winds that swept the wide plains at many times of the year and caused great evaporation even in winter time. Last year from a rainfall of 16½ inches no less than 45 inches of water were evaporated from the free surface of lakes and dams in the district.

The experiments being undertaken at the present time comprised Dry Farming Investigations, Irrigation Investigation, Stock Breeding, and Stock Feeding.

Grading Operations.—Throwing up Banks with Check Banker.

The dry farming investigations comprised:—

(1) Crop Rotation Tests.
(2) Soil Fertilization Test.
(3) Soil Renovation Tests.
(4) Improvement of Pastures.
(5) Improvement of Cereals by systematic breeding.
(6) General Research Work.

The inspection was then commenced, explanations being given by Mr. Richardson as the visitors moved from field to field. Particular interest was taken by the visitors in the demonstration of the cross-breeding of wheats. The lucerne fields were also very attractive.

Afternoon tea was then served at the Farm, at the conclusion of which Mr. Angus, M.L.A., in proposing a vote of thanks to the Minister for arranging the visit, said that all present were very grateful to the Hon. the Minister, Dr. Cameron, Mr. Richardson, and the other officials who had helped to make the visit both instructive and enjoyable. Visits of this kind were necessary in order to get exchange of ideas, and to be instructed by those who had made a life-study of agriculture. The Farm

had only been going for two years, and under unfavorable circumstances; in fact, the present season could not be worse. He had been greatly impressed with the results achieved. What had perhaps struck him most was the very fine lucerne that had been inspected that afternoon. It demonstrated the great possibilities there were in the district for

Smoothing the Check Banks.

lucerne growing. He had no hesitation in saying that lucerne was one of the most profitable crops going. With a fair water supply he considered there would be a great future for the Werribee district, and the area of land that had remained so long in the hands of the Government would, he hoped, in the near future be developed, and prosperous homes spring up in the district.

Grading Land at Werribee.

Mr. A. Rodgers, M.P., in seconding the vote of thanks to the Minister, stated that he wished to apologize for the absence of many of the Northern farmers, and to assure the Minister, the Director, and the Agricultural Superintendent that it was not owing to lack of interest

in the work being undertaken, but to other regrettable causes. Two great factors were at present operating against the farmers, firstly, the great National crisis, and secondly, the threatened drought throughout Australia.

Recently some of the most scientific men of the world had paid a visit to the Werribee Farm, and had declared that the work being done

Even Distribution of Water on Graded Land.

was of a character to be very proud of, and was the right class of work to be carried out.

In conclusion, he urged that the farmers of Victoria should sow larger areas next year, as past experience had shown that the year following a drought was generally a good season. He earnestly hoped

Two Year Old Lucerne.

that next season's returns would be such as to make up for the losses this year.

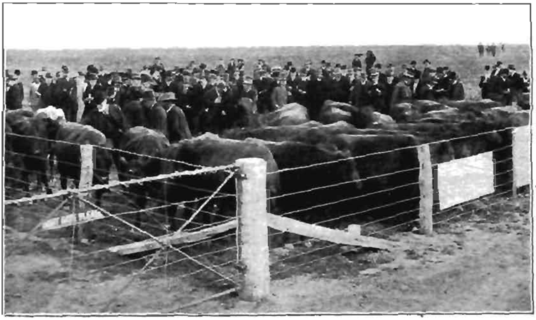
The Hon. A. R. Robertson, M.L.A., stated that it afforded him pleasure to be present that day, and to see that any trouble he had had in forwarding the construction of the Pyke's Creek Reservoir for the supply of irrigation water to Werribee was justified by its success. One had

only to look at the fine crops of lucerne to see that Werribee was an irrigation proposition.

He wished to thank the Minister for the opportunity of being present that day, and he considered a word of praise was due to the officers of the Agricultural Department for the excellent work done in a short

Harvesting Lucerne.

space of time, the operations at the farm having been commenced only two years ago. After the inspection of the farm just made those present could not help realizing that the hand of the master had been engaged on the work. The experiments being carried out were applicable to 75 per cent. of Victoria.



Experts Handling the Red Poll Milkers.

He urged the farmers of Victoria not to be disheartened on account of the drought, but to put in a larger area of crop next season, and to have confidence in the country because the potentialities of the country have been scarcely tapped.

Mr. Donald Stewart (Vice-President Royal Agricultural Society), said that it was his first visit to the farm, and he had been impressed

at the work being done and the various experiments going on. He considered the Department of Agriculture was the right body to carry out the experiments. It would mean a big loss to the individual farmer if he were to carry out experiments and they were a failure, whereas with the Government money everybody paid for it.

He had promised to let the Department of Agriculture have a few of his merino sheep for the purpose of carrying out experiments in fine wool in conjunction with the Cambridge University.

The Director of Agriculture (Dr. S. S. Cameron) explained that the experiments intended to be carried out with the sheep were the result of a suggestion at the time of the visit of the members of the British Association for the Advancement of Science in August. The Cambridge University for the past four or five years had been carrying out detail work in connexion with breeding to determine the inheritance of wool characters. The suggestion was made at one of the meetings in Melbourne after the visit to the farm, that it would be good if the practical portion of the work, viz., the breeding operation, could be carried out in Victoria, and the technical work in the laboratories of Cambridge. On the matter being submitted to the Hon. the Minister of Agriculture he agreed. That was followed by an arrangement with the Cambridge authorities. The experiments would be carried on for a number of years.

He was glad to think that, as far as he knew, this was the first occasion on which any experimental station had been called upon to work in conjunction with a university so old established as Cambridge.

Mr. Stewart had promised to supply the Department with the required number of suitably selected merino ewes. He wished to thank him heartily, and to say that, on the matter being mentioned to Mr. Stewart, he entered into the scheme with great enthusiasm.

The Minister of Agriculture (The Hon. W. Hutchinson, M.L.A.), expressed his gratitude for the very kindly sentiments and words of great appreciation expressed by the various speakers. In Dr. Cameron (Director of Agriculture), Mr. Richardson (Agricultural Superintendent), and Mr. Wilson (Farm Manager), the Department had three men of whom they were justly proud. They had given themselves wholeheartedly to the work of making the farm a credit to the State, and an advantage to the whole farming community.

Agriculture was a creative industry on which their very life and salvation was based, and the present drought made not only the agriculturist but the whole community realize how dependent they were on the agricultural industry. It was the business of the Department and of the Government to lead the way and help along the industry. The Department wanted to feel that the farming community was behind them in their efforts. The Department invited fair criticism at all times. Of course any Department conducting progressive movements will make failures. They were, however, in the main doing good work. The full design of the men he had mentioned, and the staff behind them was to help the community. They were doing it loyally, and on their behalf he thanked them for the appreciation expressed.

The proceedings then concluded with the singing of the National Anthem.

Overheard at the Central Research Farm on the occasion of the Second Annual Farmers' Field Day.

The Scotchman says, "it takes a muckle to boil good soup out of cobble stones," but the Department of Agriculture is getting a lot out of this Werribee soil.—*A Mallee Farmer.*

I like the horse (Major Oates)—my word, he is fine.—*President Agricultural Society, Lang Lang.*

I am very pleased I came, for many lessons are to be learned. One striking feature is that everything is in its place—this is a lesson for every farmer to take to heart.—*A Yarragon Farmer.*

It is very interesting and seems easy, but I guess the operator is a past master with those pincers (a reference to the demonstration on the cross fertilisation of wheats by Mr. Richardson).—*A Bystanding Farmer.*

Lime seems to have had not much effect on the lucerne, but, of course, you can't tell until the "cut" goes over the weigh-bridge.—*Mr. Robertson, M.L.A.*

Dr. Cameron's cow bails are very good—simple, compact, next door to automatic, and yet strong enough to withstand all the knocking about usually given.—*A Practical Dairy Farmer.*

"Plough, plough well, and plough again."—The Minister of Agriculture in brief in his address to the farmers. Mr. Hutchinson advised farmers to plough larger areas next year in view of this year's drought and the war.

The Agricultural Deartment would do better with the fine herd of Red Polls if they were given an area for dairy experimentation in Gippsland. The pasture here does not give them much time for sleep. —*A Gippsland Farmer.*

The individual farmer cannot experiment on this scale. It is very necessary work, and it is better for all of us to defray the cost.—*Mr. Stewart, Vice-President Royal Agricultural Society.*

I have an orchard myself, and am particularly interested in green manuring, in that I am growing peas between the rows and ploughing under. I am well repaid for my visit—the lucerne is wonderful.—*A Farmer from Mt. Waverley, near Oakleigh.*

I have a family of twelve. This is one of my sons. I brought him down to-day with the object of furthering his education.—*A South Gippsland Farmer.*

I was down last year, and intend coming every year. The crops look better this year than last on a smaller rainfall.—*A North-Eastern Visitor.*

There is something in top dressing with soda nitrate. Just look at the remarkable difference in the colour and strength of the crop. Make a note of it.—*Two Young Northern Farmers.*

THE WALNUT.

(Continued from page 461.)

By C. F. Cole, Orchard Supervisor.

PLANTING.

When *planting out an area of walnuts it is absolutely necessary*, if the trees are to thrive and become productive, to give them plenty of room, so that all sides of the trees will be exposed to the air and light. This is an important factor, and should not be overlooked.

Walnut trees, if healthy, continue making growth more or less during their whole existence, and form large spreading tops; close planting should, therefore, be avoided. If planted too close the trees will very soon come together, excluding the light and open air, such conditions greatly diminishing the production of nuts and longevity of the trees.

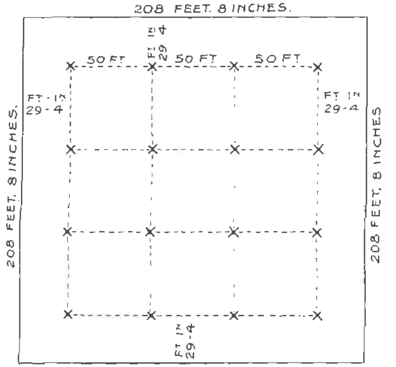


Plate 7.—Plan showing one acre of Walnuts planted on the square system. Trees 50 feet apart. × denotes position of trees. 16 trees to the acre.

The distance the trees are to stand apart in the rows should be controlled by the soil, locality, and varieties planted. With strong growing varieties upon real good soil the trees should not stand less than 50 *feet apart in the rows, with dwarf-growing varieties* 40 *feet apart.*

To find the number of trees that will be required to plant an acre on the square system (which system the writer recommends), multiply the distance apart the trees are to stand in the rows and divide the result into the number of square feet in an acre, thus:—

$$50 \text{ feet} \times 50 = \frac{43,560}{50 \times 50} = 17 \text{ trees.} \quad 40 \times 40 = \frac{43,560}{40 \times 40} = 27 \text{ trees.}$$

Assuming that 1 acre only is to be planted upon the square system 50 x 50 or 40 x 40, it will be found that in practice only sixteen trees and twenty-five trees, as shown in plates 7 and 8, should be planted. It should also be noticed in plates 7 and 8 that headlands 29 ft. 4 in. and 24 ft. 4 in. are left around the whole area. This is done to use up the whole acreage so as to have the trees uniformly and systematically planted.

When planting a large area it will be found that seventeen trees and twenty-seven trees can be planted per acre, the width of the headlands being reduced to half the distance the trees are to stand apart in the rows. This will allow plenty of light and air upon the boundary side of the trees, and unless the trees make exceptional growth there is very little likelihood of them overhanging the boundary fences.

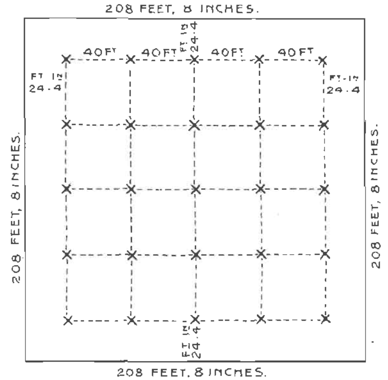


Plate 8.—Plan showing one acre of Walnuts planted on the square system. Trees 40 feet apart. × denotes position of trees. 25 trees to the acre.

When measuring off a large area for planting, *i.e.*, if the trees are to stand 50 x 50 feet apart, a headland 25 feet wide should be marked off; if 40 x 40 feet, a headland 20 feet wide should be left around the area. It is necessary to plant not less than either one of the distances stated if the future productiveness of the trees is to be studied. Interplanting with other profitable fruiting trees, or the cultivation of root crops, may be carried out without causing injury to the walnuts.

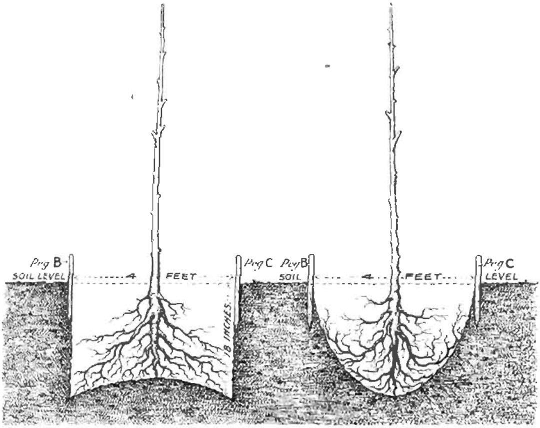
Having decided the distance apart the trees are to stand in the rows, strike out a base line, leaving the distance in feet required for a headland. The base line should run parallel with any known straight line, such as the fence.

The best material for marking a base line is a length of ordinary fencing wire looped at each end and notched with solder at the distances the trees are to be planted apart. When placing the base line in position

two crowbars, or some other suitable instrument, should be used, passing one through the loop at one end of the wire and securely fixing it in the ground; then draw the wire taut, pass a crowbar through the other loop and fix.

Having done this, pegs about 18 inches in length should be driven into the ground at the solder notches upon the wire, indicating where the trees are to stand when planted.

The best principle is to mark out the outside of the area first, and then fill in by pegging out the whole area. The holes to receive the trees should be dug out in a square, about 4 feet across, the peg being the centre. The depth is controlled by the tap root, the average being from 12 to 18 inches. It is important when digging out the holes that they are dug out square, the corner angles being well cut out so that the



1.—Correct method. 2.—Wrong method.

Plate 9.—Planting.

roots will easily find the corners of the hole, and push through into the surrounding soil. If the sides are dug out slanting and the hole is excavated in the shape of a cup, the roots will have a tendency to work upwards, with the probability of the tree becoming stunted. Figures 1 and 2, plate 9, show the correct and wrong method of hole digging and tree planting.

If any well-rotted stable or cow manure is available, place some in the hole and mix well by stirring up the bottom soil with the spade or shovel. Also mix some with the soil removed from the hole. As it is of great importance when transplanting the walnut that the trees receive no check, and so become stunted, this manuring is of great value, the trees responding more readily to this class of fertilizer than to that of

chemical origin. Work a portion of the bottom soil to the centre of the hole in the form of a miniature mound, and upon this the tree is planted, placing the tap root on the mound in the middle of the hole and gradually filling it with a small quantity of soil, at the same time seeing that the lateral roots are spaced as equally as possible (see plate 9); more soil is then returned until the hole is filled. If after filling in it is found that the tree is placed too low, take hold and gently ease it upwards through the soil to the correct depth. The tree should not be planted deeper than as they stood in the nursery row—the surface soil mark upon the butt at the ground level being a guide. Retain a firm hold of the tree, keeping it in a vertical position, and with the foot firmly tread the soil about the tree, then level off.

Care should be exercised when pressing the soil about the tree with the foot that the tread does not become a stamp—many planters condemn this old method on account of this stamping probably causing injury and consolidating the soil too much about the roots. When planting, the soil should be open and free, not too wet and sticky. If unfavorable through heavy rains, delay planting for a few days. It is far better *for the soil to be on the dry side and water added when planting than* on the too wet side. If the work of consolidating the soil about the newly-planted trees by foot pressure be performed by practical or intelligent planters no injury will result.

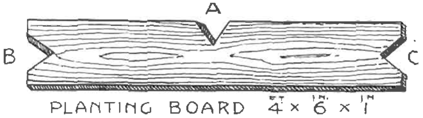


Plate 10.

The amount of pressure required is governed by the class of soil in which it is being planted.

Usually when planting in soils and localities suited to the walnut, it is *not necessary under normal conditions* to add water to the tree before finally filling up the planting hole, but if the planting season should happen to be a dry one, or the soil at all in want of moisture, the trees should be watered when the hole is half filled; after the water has soaked away the hole should be filled and the top soil pressed very lightly down.

When planting there is always a danger of getting the trees somewhat out of line. To avoid this, before the planting hole is refilled the tree should be sighted. To do this, take a stake about 4 feet long, place it in a true vertical position behind the first planting peg in advance in the row being planted, then step back a few feet and sight the stake and partly planted tree with those already standing in position. When planting an area not less than two persons should be engaged upon the work. This method of sighting can be dispensed with and planting greatly accelerated by the use of a planting board. It is a board 4 feet long, 6 inches wide, by 1 inch thick, having a V-shaped notch cut into one side in the centre, and a notch at each end (see plate 10). The board is placed on the ground against the peg that marks the position the tree is to occupy, seeing that the peg rests in the centre notch A. Then drive two pegs into the ground at the ends

of the board, B and C. The centre peg A and the board should then be removed and the hole dug inside the pegs B and C. (Plate 9.) After placing the tree in position, and before the hole is filled in, the planting board should be refixed in position inside the pegs B and C. The tree being planted should be fixed in notch A, occupying the position the marking-out peg held. The roots should then be equally spaced and the soil returned until the hole is properly filled.

If the conditions are such that the planter considers that staking the young trees is necessary, the stakes should be placed in position upon the windward side of the tree and about 4 to 6 inches away, before the planting hole is refilled. Hayband or some suitable material should be used for tying, tie tight upon the stake and loose around the tree from 24 to 60 inches from the ground level. The stake should be stout, practically straight, and stand between 4 and 6 feet above the ground. The height of stake required is controlled by the size of tree being planted. The thickness should be about 2 inches by 2 inches. If sawn from timber not of a durable nature, that portion to remain in the soil should be tarred, or else charred. If bush stakes are used remove the bark and tar or char the ends to be placed in the soil.

(To be continued.)

THE THRIP PEST.

By C. French, Junr., Government Entomologist.

Owing to the dry weather, and judging from the number of reports received by this office from peach, tomato, and other fruit-growers in the northern parts of the State, the thrip pest threatens to become very bad this season.

The thrips are now about in countless numbers, and are causing the flowers on early tomato plants to turn brown, shrivel up and fall. They also attack the flowers of beans, peas, &c.; in fact, almost every kind of flower. They also destroy the flowers of apples, pears, raspberries and strawberries.

This insect is a most difficult one to deal with on account of the habit it has of crawling into the centre of the flower. It sucks the juice, thereby causing the young fruits to shrivel up and fall.

The following remedies have proved successful:—

Benzole Emulsion.—This is a patent preparation, and can be purchased at any of the leading seed shops in Melbourne. One tin full (1lb.), when diluted, makes 5 gallons of spray. The smell of the benzole remains on the plants for several days.

As a deterrent, spraying with coal tar water or a weak kerosene emulsion is recommended. A good hosing with cold water is also beneficial. The formula for coal tar water is as follows:—Boil 1lb. of coal tar in two gallons of water, and while hot add from 50 to 100 gallons of water.

Nicotine.—Steep 1lb. of tobacco in one gallon of hot water and allow it to soak for 24 hours. Boil 1lb. of soap in 1 gallon of water until the soap is dissolved. Strain the tobacco water into the soap water. Stir well, and make up to 5 or 6 gallons. Use waste stems of the tobacco.

EXTRACT FROM "ICE AND REFRIGERATION," DATED AUGUST, 1914 (PAGE 54).

SOME DATA ON FRUIT PRECOOLING.

The great development of the precooling and fruit-shipping business from California was indicated in some statistics given by Mr. J. S. Leeds, manager of the Santa Fe Refrigerator Despatch Company, in an interview published in the San Bernardino *Daily Sun*. A total of 19,126 car loads of fruit, he said, has been precooled at the company's plant in San Bernardino, California, between the opening in 1910 and 31st May, 1914. "The first season we precooled 377 cars, but this season the figures stand at 5,500 cars. Two-thirds of all the cars moved by the Santa Fe since the opening of the precooling season, 10th March, have been precooled. There has been no claim for damaged fruit or for insufficient refrigeration since this service was inaugurated."

Mr. Leeds stated that four hours is the average time required to precool a car load of warm fruit, the temperature being reduced in that period to 45° or 50° F. As a result, much less ice is required at icing stations *en route* on the long trip to the eastern markets. "The Santa Fe," said Mr. Leeds, "stands sponsor for 60 per cent. of the fruit shipped from Southern California. We manufactured at our plant in San Bernardino, this season, 28,000 tons of ice, and to do this added 225 tons as a daily output. Still we were required to purchase 20,000 tons additional for refrigeration purposes this season." The Santa Fe Refrigerator Despatch, it was added, controls 9,400 refrigerator cars which are watched with the most careful attention when engaged in the transportation of fruit. From the time a car of citrus fruit leaves San Bernardino, until it reaches Chicago, takes on an average 168 hours.

REPORT ON THE CALF-REARING EXPERIMENT.

Conducted at the Woburn Experimental Farm, 1912–13.

[*Reprinted from a pamphlet issued by the Royal Agricultural Society of England.*]

An experiment was begun at the Woburn Farm in the spring of 1912 on the best way of rearing calves from birth. A general summary of this and the results till then obtained was published in the Proceedings of the Council for 6th November, 1912, and found its way into most of the agricultural papers. As, however, the experiment gave rise to a very great amount of interest, and led to numerous inquiries for "further particulars," more especially in regard to the quantities of food given and the methods of feeding, it has been considered desirable to supplement the published account.

Twenty bull calves (Shorthorns) were selected and purchased in the open market when they were two to three days old, and were brought on to the farm. They all had whole milk *only* for the first three weeks, taking on the average one gallon per head daily. At the end of three weeks they were all weighed, and were divided up, according to their

weights, into five lots of four calves each. The five lots were then put on their several different foods as follows:—

Lot 1.—Cod-liver oil and separated milk.
,, 2.—A purchased "calf meal."
,, 3.—Gruel (linseed and oatmeal) with separated milk.
,, 4.—Whole milk.
,, 5.—Crushed oats and separated milk.

In Lot 1 the idea was to replace the fat removed from whole milk (in separating it) by cod-liver oil; the "calf meal" of Lot 2 was given according to the published directions, whole milk and separated milk being used with it; the "gruel" of Lot 3 consisted of 6 lb. fine oatmeal, 1 lb. linseed, to 1 gallon of water; the oats of Lot 5 were home-grown and merely bruised in the farm mill, but not ground fine.

The costs of the several foods were: whole milk, 7d. per gallon; separated milk, 2d. per gallon; cod-liver oil, 5s. 6d. per gallon; "calf meal," 15s. per cwt; oatmeal, 17s. per cwt.; linseed, 24s. per cwt.; crushed oats (home-grown), 7s. per cwt.

The several foods were given to the respective lots for nine weeks, this being, accordingly, the duration of the first part of the experiment proper. The calves were then weighed, their age being twelve weeks. The following are the details as regards the method of feeding and the quantities of food given:—

Lot 1.—Cod Liver Oil.

Lot 1 (four calves), during the first three weeks (26th March to 15th April), consumed 86 gallons of whole milk, costing 4s. 2.16d. per calf per week. They were weighed 16th April, and started on their special diet. Whole milk was gradually replaced by separated milk, the four calves taking for the first six days 4½ gallons whole milk, and 1½ gallons separated milk daily, with eight table-spoonfuls daily of cod-liver oil stirred up with the milk. After a fortnight the whole milk went down to 2½ gallons, and the separated milk up to 3 gallons daily, and after three weeks the four calves were receiving all separated milk (6 gallons daily per lot) and so continued till the close of the nine weeks, the cod-liver oil being increased after four weeks to twelve table-spoonfuls daily. The total food consumed during this period of nine weeks by the four calves was: cod-liver oil, 2 gallons; whole milk, 59 gallons; separated milk, 307 gallons—total cost, £4 16s. 7d., or 2s. 8.19d. per calf per week. With the preliminary three weeks on whole milk the cost comes to £7 6s. 9d. for the twelve weeks, or 3s. 0.68d. per calf per week. The live weights at the respective dates were:—

Lot 1.—Cod Liver Oil.

—	April 16.			June 18.			Gain in 9 weeks.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
a	1	0	23	1	3	9	0	2	14
b	0	3	19	1	3	4	0	3	13
c	1	0	2	1	3	9	0	3	7
d	1	0	10	1	3	16	0	3	6
	4	0	26	7	1	10	3	0	12

This, accordingly, gave a gain of 9.66 lb. per calf per week, each pound gain in live weight being obtained at the cost of 3.33d.

LOT 2.—CALF MEAL.

The four calves had, as before, whole milk for the first three weeks (26th March to 15th April), averaging 1 gallon per head daily. After weighing on 16th April, they took for the first week 2½ gallons of whole milk and 1⅓ gallons of separated daily for the four calves, along with 2 gallons of calf meal. The whole milk was gradually reduced, and after three weeks the four calves took only 4 gallons daily of separated milk with the 2 gallons of calf-meal daily. The total food consumed in the nine weeks was: calf meal, 112 lbs.; whole milk, 37 gallons; separated milk, 212 gallons—total cost, £3 11s. 11d., or 2s. per calf per week. With the preliminary three weeks' feeding on whole milk, the cost came to £6 2s. 1d. for the twelve weeks, or 2s. 6.52d. per calf per week. The live weights were as follow:—

Lot 2.—Calf Meal.

—	April 16.			June 18.			Gain in 9 weeks.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
a	1	0	8	1	3	6	0	2	26
b	1	0	16	1	3	26	0	3	10
c	0	3	26	1	2	15	0	2	17
d	1	0	5	1	2	12	0	2	7
	4	0	27	7	0	3	2	3	4

This gave a gain of 8.66 lb. per calf per week, each pound gain in live weight costing 2.77d.

LOT 3.—GRUEL.

As before, the four calves had whole milk for the first three weeks (26th March to 15th April), 1 gallon per head daily on the average. They were weighed on 16th April, and thence received their special food, the oatmeal and linseed being made up into a gruel with water. For the first week the lot of four had 4⅔ gallons whole milk with 1⅓ gallons separated milk daily, and ⅓ gallon daily of gruel. The whole milk was reduced gradually, and the separated milk and gruel increased. After three weeks they were taking 4 gallons daily of separated milk and 1½ to 2 gallons of gruel daily for the lot of four. During this period one calf began to show signs of scouring, and as it had eventually to be removed from the experiment, it is left out of account in the final reckonings. The total food consumed in the nine weeks by the four calves was: oatmeal, 84 lbs.; linseed, 14 lbs.; whole milk, 57 gallons; separated milk, 224 gallons; cost, £4 6s. 4d.; being 2s. 4.77d. per calf per week, or, reckoning the three weeks' preliminary feeding on

whole milk, £6 16s. 6d., being 2s. 10d. per calf per week. The live-weights were—

Lot 3.—Gruel.

—	April 16.			June 18.			Gain in 9 weeks.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
a	1	0	8	1	2	27	0	2	19
*b**	0	3	27	1	2	0*	0	2	1
c	1	0	14	1	3	11	0	2	25
d	1	0	6	1	2	19	0	2	13
	4	0	27	6	3	1	2	2	2

* Calf scouring.

Leaving out the calf that was not well, this gives a gain of 225 lbs. for three calves during the three weeks; being 8.33 lbs. gain per calf per week, each pound gain in live weight costing 3.45d.

Lot 4.—Whole Milk.

This lot were purchased a week later than the foregoing, so that their preliminary feeding began on 3rd April. They were weighed on 23rd April, and continued for the next nine weeks on whole milk, taking, on the average, a gallon each daily at first, and then going up to 1½ gallons each after a fortnight's time. In the nine weeks they consumed, in all, 356 gallons of whole milk, costing £10 7s. 8d., being 5s. 9.22d. per calf per week, or, with the preliminary feeding, £12 17s. 10d., being 5s. 4.45d. per calf per week. The live weights were—

Lot 4.—Whole Milk.

—	April 23.			June 25			Gain in 9 weeks.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
a	1	0	11	2	0	11	1	0	0
b	0	3	23	1	3	24	1	0	1
c	1	0	11	2	0	16	1	0	5
d	1	0	24	2	1	4	1	0	8
	4	1	13	8	1	27	4	0	14

This gave a gain in live weight of 12.83 lbs. per calf per week, each pound gain costing 5.39d.

Lot 5.—Crushed Oats.

These four calves were bought a fortnight after the whole-milk ones, so that the preliminary feeding took from 16th April to 6th May. They were weighed on 7th May and put on their diet. At first they were given whole milk only—5 gallons daily amongst the four. The crushed oats were given them, as they would take it, a handful at a

time. For the first six days the lot of four took 1 lb. of oats daily. Then the whole milk was reduced, separated milk was brought in, and the oats increased to 2 lbs. daily amongst the four. After twenty-four days, whole milk was dropped altogether, and 6 gallons of separated milk given daily, with 4 lbs. oats daily, to the four. It is of importance to note that the crushed oats were always given *dry*, and never mixed up with the milk or made into a gruel.

During the nine weeks the four calves consumed 208 lbs. crushed oats, 66 gallons whole milk, and 296 gallons separated milk, costing in all £5 0s. 10d., being 2s. 9.61d. per calf per week, or, reckoning the preliminary feeding, £7 11s., being 3s. 1.75d. per calf per week. The live weights were—

Lot 5.—Crushed Oats.

—	May 7.			July 9.			Gain in 9 weeks.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
a	1	0	21	2	1	4	1	0	11
b	1	1	3	2	1	11	1	0	8
c	1	0	10	2	0	7	0	3	25
d	1	0	8	2	0	23	1	0	15
	4	2	14	8	3	17	4	1	3

This gave a gain of 13.30 lbs. per calf per week, each pound gain in live weight costing 2.52d.

The following table gives the results in comparative form:—

—	Food.	Cost per Calf per week.	Gain per Calf per week.	Cost per lb. gain in live weight.
		s. d.	lb.	d.
Lot 1 ..	Cod liver oil	2 8·19	9·66	3·33
„ 2 ..	Calf meal	2 0	8·66	2·77
„ 3 ..	Gruel ..	2 4·77	8·33	3·45
„ 4 ..	Whole milk	5 9·22	12·83	5·39
„ 5 ..	Crushed oats	2 9·61	13·30	2·52

From this table it will be seen that the crushed oats gave the highest gain in live weight and at the lowest cost per pound of increase. The next highest gain was with whole milk, but the cost, it will be noticed, was much increased. Between the other feedings there was not much to choose.

The calves, as they finished their nine weeks' special feeding, and now being twelve weeks old, were turned out into the yard, and all fed alike with separated milk, a little linseed cake and crushed oats. On 14th July, milk was given up, and on 18th July the calves were all turned out to run in the fields, being given linseed cake, crushed oats, and hay. On 1st September one calf—from the crushed oats lot—was found to be ill and dying, so that it was killed, the case, unfortunately,

proving to be one of anthrax. None of the other animals were, however, attacked. On 17th September (after ninety-one days' further feeding) the calves were again weighed. On 23rd September all were castrated,* and then fed on throughout the winter, being out in the fields in day-time, and coming into the yard at night, where they had linseed cake with a little cotton cake, hay, and sliced roots. On 5th February, 1913, having completed twenty weeks since the last time of weighing, they were again weighed, and the results for 17th September, 1912, and 5th February, 1913, are given in the following table:—

—	Live weight, 18th June, 1912.			Live weight, 17th Sept., 1912.			Average gain per head daily, 1st period.	Cost per head per week during 1st period.		Live weight, 5th Feb., 1913.			Average gain per head daily, 2nd period.	Average gain per head daily, whole period.
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	lbs.	s.	d.	cwt.	qrs.	lbs.	lbs.	lbs.
Lot 1.—Cod liver oil	7	1	10	13	2	4	1·90	2	8·19	21	2	21	1·63	1·74
" 2.—Calf meal..	7	0	3	12	2	26	1·75	2	0	20	1	18	1·53	1·62
" 3.—Gruel (3 calves) ..	5	1	1	9	0	11	1·57	2	4·77	16	2	16	2·01	1·84
" 4.—*Whole milk*, 25th June	8	1	27	14	2	1	2·00	5	9·22	23	3	27	1·90	1·94
" 5.—Crushed oats (3 calves), 9th July ..	6	2	13	10	2	6	2·19	2	9·61	17	3	14	1·90	2·00

From this table, in conjunction with the preceding one, is drawn the interesting general result that not only did the crushed oats and separated milk feeding (Lot 5) give the highest gain at the least cost during the feeding of nine weeks with the special foods, but that subsequently, when the calves were turned out in the fields and all fed alike, the gain of live weight continued to be higher with this feeding than with any of the other foods. This would lead to the valuable conclusion that the influence of the early feeding of calves has an important bearing on their after development, and that a "good start" is very essential. The improvement effected by the early feeding with dry crushed oats was thus maintained for a period of quite seven *months after the special feeding had been dropped.* The next best result as regards increase of weight was obtained with the whole-milk calves, and it must be freely said that in February, 1913, they looked the best of all the lots, having more "bloom" on them than any of the others. In fact, it was then quite possible for any one looking over the calves when all together to pick out which were the "whole-milk" ones. The "crushed oats" lot similarly stood out above the remainder, and undoubtedly the poorest of all were the calf meal lot. These relative appearances had practically been maintained throughout.

It is intended to carry on the experiment until the bullocks are ready to be sent to the butcher.

J. AUGUSTUS VOELCKER.

* This operation had been purposely delayed in order not to interfere with the experiment in its earlier stages.

LUCERNE.

The hardy nature of the lucerne plant allows of it establishing itself and flourishing under conditions which would be fatal to most other fodder plants; and, in consequence, it may frequently be found in most unexpected situations putting forth an abundance of green shoots and flowering freely in the driest of seasons, in marked contrast to the surrounding herbage.

The past summer has been a very dry one; yet, as is shown by the accompanying photograph taken in the middle of February, a self-sown patch of lucerne on the side of the steep railway cutting close to Jolimont station, has made fine growth. The bank here extends to some 18 feet above the rails; and the lucerne is from 3 to 8 feet from the bottom. How the seed came there is a matter for conjecture; but the result bears indisputable testimony to the fact that lucerne is not a tender plant, and that it requires more than ordinary dry weather to stop its growth.

Lucerne Growing in Railway Cutting, Jolimont.

For years past there have been several fine stools of lucerne growing in an equally dry situation at the top of the railway cutting above the Camberwell station. These are too scattered to show effectively in a photograph; but the stand they have made through all weathers is striking evidence of the great vitality of this fodder plant; and, even after the surrounding dry grass has been burned off in clearing up along the line each year, the lucerne will be seen shooting to some 18 inches high, and then flowering and seeding. Many other instances could be given of this plant doing well under most adverse conditions, not only in the suburbs, but in many of the outlying districts; and if the object-lessons thus furnished were more widely known, they would do much towards dispelling the too-commonly held opinion that lucerne is a difficult crop to grow. The real fact is that we have no hardier fodder plant; and none that will give a better return for the little labour required in its cultivation.—[J. S. McFadzean, Senior Dairy Supervisor.]

FOWL MANURE FOR HAY.

On the farm of Cr. Jas. Stevens, at Guildford, on the Castlemaine to Maryborough Railway, a very fine illustration of the benefit accruing from the conservation and use of fowl manure is to be seen.

Mr. Stevens, in experimenting with various manures, treated a corner of the paddock, approximately a quarter of an acre in extent, with air-dried fowl manure, at the rate of ½ ton to the acre.

The plot at the present moment (August) is inches ahead of the rest of the paddock.

The soil is the usual poor clay loam overlying Silurian rock, and the paddock was sown for hay. The crop on the plot manured with fowl manure is so well forward that it completely obscures the colour of the soil. A healthy green mat covers the surface, whereas the rest of the paddock is merely tinged with green.

The effect of the manure is so pronounced that it catches the eye of the most casual observer.

The following analysis of fowl manure taken from Storer* may prove of interest:—

Fresh Fowl Excreta.

Water	56 per cent.
Organic matter	25.5 per cent.
Nitrogen	1.6 per cent.
Phosphoric acid	1.7 per cent.
Potash	.8 per cent.
Lime	2.2 per cent.
Magnesia	.8 per cent.

The following is the estimated quantity produced per annum:—Hen, 12 lb.; duck, 18 lb.; goose or turkey, 25 lb.

The fowl manure used by Mr. Stevens was air dried and would probably contain only 20 per cent. moisture, in which case the analysis would be—

	Lbs. per ton.
Water, 20 per cent.	—
Organic matter, 46.4 per cent.	1039½
Nitrogen, 2.91 per cent.	65¼
Phosphoric acid, 3.10 per cent.	69½
Potash, 1.46 per cent.	32¾
Lime, 4.00 per cent.	89½
Magnesia, 1.46 per cent.	32¾

The second column gives the pounds of plant food contained in one ton of manure, and in this case the figures also stand for pounds per acre.

It should be noted that not only has the soil been treated with a fair dressing of a complete manure, but, approximately, half a ton of humus has been applied in addition.

The approximate value of one ton of fresh fowl manure is £1, but when conserved, dried, and used on the farm the value is considerably increased.

One ton of fresh manure would be produced annually by approximately 190 birds.—W. C. R., Agricultural Laboratory, Victoria.

* [illegible], Vol. I., 368.

A NOTE ON THE UTILIZATION OF MUDS AND SCUMS FROM SUGAR REFINERIES.

In the past the muds and scums from sugar refineries have been thrown away, but in the United States of America the sugar producers are trying to dry the same for the phosphoric acid content.

The following are two analyses of the sugar, mud, or scum:—

Constituent Estimated.	No. 1. Gardiner.	No. 2. Flicque.
Water	67·32	52·70
Sugar	..	3·50
Nitrogenous matter	..	3·72
Nitrogen	1·14	..
Potash	Trace.	..
Phosphoric Acid (P_2O_5)	8·33	4·77
Lime, Iron, &c.	..	26·07

—By R. F. Gardiner, Bureau of Soils, Washington.

—Extract from *Journal Industrial and Engineering Chemistry*, June. 1914.

When this mud is well dried it will produce a fertilizer with a potentially high content of plant food.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Monthly Report, Ending 14th October, 1914.

The figures this month are of special interest, as the competition has now run for six months. Last year the leader at six months (J. H. Gill) had a score of 838—a world's record; whilst the same competitor this year has a score of 858, and E. A. Lawson, who is second this year, has scored 841, *i.e.*, three in front of last year's leading score.

The dry mash is so far proving a complete success, W. N. O'Mullane leading with 834, and E. A. Lawson second with 816; and the heavy breeds, by the aid of the thirty additional pens, have proved their great importance to utility breeders. J. McAllan leading with 789, and J. Ogden second with 759; whilst in heavy breeds, dry mash, D. Fisher is leading with 687, and T. W. Coto second with 597.

The rainfall for the past month was 101 points, with fine and bright weather. The warm spell experienced developed considerable broodiness amongst some of the heavy breeds, and breeders should endeavour, if possible, to avoid breeding from such birds, which are marked with a ring.

The feeding has been on similar lines to last month.

The general health of the birds remains excellent.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Sept.	15th Sept. to 14th Oct.	Total to date, 6 months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
25	*White Leghorns*	*J. H. Gill*	708	150	858	1
36	"	E. A. Lawson	684	157	841	2
9	"	J. J. West	655	130	785	3
10	"	R. Hay	634	129	763	4
16	"	A. R. Simon	617	141	758	5
26	"	*Mrs. H. Stevenson*	591	150	741	6
40	"	J. Schwabb	593	139	732	7
17	"	F. Doldissen	587	136	723	8
37	"	S. Brown	585	135	720	9
33	"	W. G. Osborne	566	147	713	10
44	"	*A. Ross*	576	132	708	11
29	"	V. Little	565	138	703	12
35	"	W. Tatterson	561	140	701	13
45	"	H. C. Brock	560	136	696	14
19	"	Marville Poultry Farm	551	143	694	15
4	"	*Giddy and Son*	540	143	683	16
3	"	T. A. Pettigrove	548	121	669	17
11	"	C. J. Jackson	525	141	666	18
12	"	A. H. Mould	528	131	659	19
23	"	S. Buscumb	522	136	658	20
15	"	*E. Waldon*	504	145	649	21
47	"	W. G. Swift	504	132	636	22
1	"	F. G. O'Bree	487	143	630	23
28	"	Utility Poultry Farm	487	140	627	24
34	"	W. A. Rennie	497	129	626	25
8	"	*F. W. Brine*	469	144	613	26
30	"	G. W. Robbins	481	130	611	27
2	"	J. C. Armstrong	467	143	610	28
13	"	H. Hanbury	484	122	606	29
48	"	Bennett and Chapman	474	124	598	} 30
22	"	*B. Mitchell*	460	138	598	
24	"	C. Pyke	465	132	597	32
6	"	C. R. Jones	440	134	574	33
14	"	F. C. Western	432	141	573	34
42	"	E. W. Hippe	429	137	566	35
20	"	*A. W. Hall*	419	140	559	} 36
38	"	G. Hayman	412	147	559	
32	"	Gleadell Bros.	413	137	550	38
18	"	All-lay Poultry Yards	398	137	535	39
31	"	E. H. Bridge	384	135	519	40
21	"	*B. A. Lewis*	389	126	515	41
5	"	A. Mowatt	361	141	502	42
49	"	A. Beer	366	134	500	} 43
41	"	Doncaster Poultry Farm	353	147	500	
43	"	G. Mayberry	342	122	464	45
39	"	*R. L. Appleford*	308	133	441	46
27	"	Walter M. Bayles	302	110	412	47
50	"	F. G. Silbereisen	276	127	403	48
46	"	C. L. Sharman	288	112	400	49
7	"	B. Cohen	243	112	355	50
		Total	24,030	6,769	30,799	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Sept.	15th Sept. to 14th Oct.	Total to date, 6 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	677	157	834	1
55	„ ..	E. A. Lawson	664	152	816	2
65	„ ..	W. G. Osborne	611	147	758	3
53	„ ..	C. Lawson	586	148	734	4
58	„ ..	Miss L. Stewart	558	136	694	5
51	„ ..	Moritz Bros.	518	147	665	6
61	„ ..	H. Hanbury	514	148	662	7
63	„ ..	Hanslow Bros.	463	135	598	8
68	„ ..	E. W. Hippe	434	126	560	9
70	„ ..	W. H. Robbins ..	408	140	548	10
64	„ ..	E. A. Carne	397	149	546	11
52	„ ..	Myola Poultry Farm ..	397	145	542	12
62	„ ..	A. Greenhalgh	399	138	537	13
57	„ ..	J. Jackson	388	142	530	14
54	„ ..	G. Carter	378	151	529	15
69	„ ..	C. J. Beatty	396	131	527	16
59	„ ..	F. G. Silbereisen ..	350	156	506	17
67	„ ..	Walter M. Bayles ..	373	112	485	18
66	„ ..	S. Brown	220	115	335	19
		Total	8,731	2,675	11,406	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	J. McAllan	654	135	789	1
71	„ ..	J. Ogden	634	125	759	2
89	„ ..	Marville Poultry Farm ..	598	145	743	3
88	„ ..	H. H. Pump	593	138	731	4
81	„ ..	D. Fisher	602	109	711	} 5
82	„ ..	J. H. Wright	578	133	711	} 5
84	Rhode Island Reds	J. Mulgrove	578	128	706	7
76	Black Orpingtons ..	W. P. Eckermann ..	510	128	638	8
74	„ ..	S. Brown	503	116	619	9
75	„ ..	Fairdeal Poultry Farm ..	479	125	604	10
72	„ ..	T. W. Coto	486	116	602	11
87	„ ..	A. Douglas	420	144	564	12
73	„ ..	J. A. McKinnon ..	434	124	558	13
83	„ ..	Cowan Bros.	471	84	555	14
78	Red Sussex ..	Jorgen Anderson ..	401	65	466	15
85	Golden Wyandottes	J. C. Mickelburgh ..	365	95	460	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	257	96	353	17
86	Buff Wyandottes ..	W. G. Swift	255	57	312	18
		Total	8,818	2,063	10,881	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	564	123	687	1
90	„ ..	J. H. Wright	460	142	602	2
94	„ ..	T. W. Coto	507	90	597	3
98	„ ..	A. Greenhalgh	459	133	592	4
97	„ ..	J. McAllan	476	110	586	5
91	„ ..	C. E. Graham	419	101	520	6
96	Rhode Island Reds	Myola Poultry Farm ..	385	122	507	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	350	121	471	8
93	„ ..	Myola Poultry Farm ..	336	103	439	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	223	126	349	10
95	„ ..	C. L. Hewitt	109	94	203	11
		Total	4,288	1,265	5,553	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

STATISTICS.

RAINFALL IN VICTORIA.—THIRD QUARTER, 1914.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	July.		August.		September.		Quarter.	
	Total.	Average.	Total.	Average.	Total.	Average.	Total.	Average.
	points.	*points.*	*points.*	*points.*	*points.*	*points.*	*points.*	*points.*
Glenelg and Wannon Rivers	245	323	56	303	88	310	389	936
Fitzroy, Eumerella, and Merri Rivers	340	357	66	324	136	325	542	1006
Hopkins River and Mount Emu Creek	257	242	51	256	99	284	407	782
Mount Elephant and Lake Corangamite	288	229	50	243	98	278	436	750
Cape Otway Forest ...	561	395	112	407	234	410	907	1212
Moorabool and Barwon Rivers	265	225	59	242	103	260	427	727
Werribee and Saltwater Rivers	138	191	54	205	124	248	316	644
Yarra River and Dandenong Creek	347	307	112	299	194	332	653	938
Koo-wee-rup Swamp ...	512	304	108	318	170	348	790	970
South Gippsland ...	547	359	102	373	168	412	817	1144
Latrobe and Thomson Rivers	610	304	101	338	175	382	886	1024
Macallister and Avon Rivers	344	152	37	208	141	200	522	560
Mitchell River	333	218	67	196	131	256	531	670
Tambo and Nicholson Rivers	410	199	76	173	147	230	633	602
Snowy River	520	292	93	240	217	309	830	841
Murray River	81	208	31	185	38	189	150	582
Mitta Mitta and Kiewa Rivers	224	430	52	321	116	327	392	1078
Ovens River	229	449	66	338	106	342	401	1129
Goulburn River	159	289	55	250	58	249	272	788
Campaspe River	133	266	40	237	39	266	221	769
Loddon River	104	187	37	189	29	193	170	569
Avon and Richardson Rivers	73	185	29	176	14	180	116	541
Avoca River	75	159	36	170	21	182	132	511
Eastern Wimmera	96	237	26	236	23	251	145	724
Western Wimmera	98	238	24	211	24	238	146	685
Mallee District	38	135	8	137	9	147	55	419
The whole State ...	215	250	49	235	81	253	345	738

100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Spraying.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray into a pump barrel that has not been washed out very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November, it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shothole, and other fungus diseases must be kept in check. Various sprays are required for all of these troubles, and the necessity of always having a clean pump will thus be admitted.

At the present time, the wisest spray to use for peach aphis will be a strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. It has been definitely ascertained that this is the best remedy, and all other mixtures should be discarded in its favour. Its permanent qualities, combined with an effective killing strength, render this mixture invaluable; at the same time, it is easily mixed, and so very few brands leave any sediment, that the work of spraying is now reduced to a minimum.

If the spraying is careful and thorough, no bandaging need be carried out. The time spent in bandaging will be far better employed in an extra spraying. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that, the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

Now that arsenate of lead is produced with such an excellent degree of killing strength, it is not necessary to spray nearly so frequently as it was in former years; and it may be found that four sprayings, and perhaps only three, will be sufficient to keep this pest in check.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a good number of buds if this insect is sprayed. Nicotine solution or pine spray may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover; and if the orchard soil is at all heavy or stiff, the grower should make up his

mind to grow a cover crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cut worm moths, &c.

GENERAL WORK.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass or straw mulching, not too rich in animal manure.

The disbudding of unnecessary shoots, and the pinching back or stopping of growths, to prevent them being unduly prolonged, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, watering and mulching them after planting.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back, crowded bunches and shoots should be thinned, the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into the flowering and lateral growths. Watch the plants for mildew, and use the sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it may be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in its new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, tubers of dahlias, and seed of such tender annuals as phlox drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos, and portulaca.

While seeds germinate and grow fairly well planted out in the open, it is more advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need only be on the one side, preferably the west or north-west; the seedlings are then protected during the hottest portion of the day. At the same time, the shading should not be sufficient to unduly "draw" them.

The seeds must not be deeply sown, and all waterings should be light. A little water and often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have room to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias should now be planted out, either from tubers or from young rooted cuttings. These will give good summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for their protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy; the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

NEW GOVERNMENT COOL STORES, VICTORIA DOCK.

The new Government Cool Stores, Victoria Dock, situated between Dudley and Pitt streets, on the north side of the dock, were officially opened by His Excellency the Governor, Sir Arthur L. Stanley, K.C.M.G., &c., on Wednesday, 23rd September.

Pressure on space in this month's issue makes it unavoidable that a report of the proceedings and description of the Stores should be delayed until the December issue.

REMINDERS FOR DECEMBER.

LIVE STOCK.

HORSES.—*Stabled Horses.*—Over-stimulating and fattening foods should be avoided. Give water at frequent intervals. Rub down on coming into the stables overheated. Supply a ration of greenstuff, if available, to all horses, or bran mash once a week with 3 or 4 packets of Epsom salts. *Brood Mares.*—Those with foals at foot should be well fed. *Early Foals* may, with advantage, be given oats to the extent of 1 lb. for each month of age daily.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron, ¼ lb. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne. Dehorn all dairy calves.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read articles on breeding and feeding in *Journals* for April, 1912, and June, 1913.

SHEEP.—In such a season as this, it will be wise management to keep rams in good heart. Feed them well in yards and allow out only half the number with the ewes alternately. A liberal number should be with the flock for seven weeks, this period admitting of any ewes coming in season the second time. Trim hoofs into shape, and clear wool and burrs from round the pizzles of rams before mating. To insure an even lot of lambs, ewes should be all one breed, or as near one cross as possible. Merino and fine cross ewes are in season early, and "first cross" or "half breds" about this month. All ewes with a preponderance of British blood come on later. Ewes carry their lambs "four months, four weeks, four days," or, roughly, five months. Unshapely, inferior-fleeced ewes are always unprofitable to keep and feed, and particularly so now.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench) and carefully remove any scion roots. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain. Look out for oidium and repeat sulphurings on first appearance of disease.

Cellar.—Fill up regularly and keep cellars as cool as possible.

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WHEAT AND THE WAR.

AUSTRALIA'S OPPORTUNITY.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The largest, most violent, and destructive war in history has been aging without intermission for over four months. It was at the outset enerally admitted that, in the event of a clash between the vast armies f Europe, the conflict must necessarily be of short duration, in view f the unparalleled magnitude of the opposing forces. Competent ilitary opinion, however, has now declared that the struggle will be airly prolonged, and it is possible that years may elapse before a final nd lasting peace is declared. In any case, the probable effects of the onflict on the demand for foodstuffs and on agricultural production hould be of more than passing interest.

In this article it is intended to submit data to show that the war, if rolonged, must inevitably lead to a material and an unsatisfied demand n Europe for all kinds of imported foodstuffs, and most particularly or wheat.

European Wheat Production Diminishes and Consumption Increases.

In the first place, the present European conflagration differs from all revious wars in several important respects. The conscript armies of o-day have no parallel in former times as regards numbers of combatants, capacity for destruction by sea, air, and land, or in respect of the uge expenditure on armament, ammunition, equipment, and aintenance.

The armies involved in the struggle will appropriate and use wastefully in their advance through the enemy's country such crops and grain as they may need, and, in their retreat, will probably burn and destroy every stack of grain and flour that cannot be conveyed safely to their bases. Furthermore, of all the regions of Europe, Prussia will probably suffer most, *for this State is the granary of the German Empire so far* as wheat, rye, and oats are concerned.

With every man in Western Europe between nineteen and forty-five either called to the colours or engaged in some form of military service, *it is impossible to resist the conviction that the normal agricultural* conditions prevailing in these lands must be so seriously upset as to lead to inefficient preparation of the soil and consequent general shortage of production. Indeed, agriculture will be at a positive stand-still along the huge battle line on both western and eastern frontiers.

Russia's wheat area borders on Germany, and lies between the Baltic Sea and Gulf of Finland on the north, and the Black and Caspian Seas on the south. The grain fields of the Dual Monarchy are mostly on the Hungarian Plains, whilst those of Germany are in Prussia.

The ebb and flow of battle along the western frontier, and the perpetual menace of the armed millions converging on the eastern frontiers for the avowed purpose of overrunning the country, must be an ever-present fear in the minds of the inhabitants of Poland, Prussia, and Hungary, and must necessarily result in a suspension of agricultural work within the zone of conflict.

Wheat is now (November) being sown in Northern Europe, but it is safe to say that very little will be sown in East Prussia, Hungary, Belgium, nor in those parts of France at present held by the Germans. Moreover, the withdrawal of so many million hands from the grain fields in those parts outside the present zone of conflict at the very time when their labour is so sorely needed, must result in lack of proper autumn preparation and a consequent poor crop.

In addition to this it must be remembered that, quite apart from any wanton damage caused by the vast armies, the men are being fed under circumstances which render waste more or less unavoidable.

For these various reasons, *it would appear that production in the countries of conflict will certainly be far short of the normal, whilst consumption and waste will be far in excess of normal.*

Normal Production and Consumption of Europe.

Of the world's total production of wheat, more than one-half is produced by Europe, and nearly 40 per cent. of the world's wheat is produced by the countries now in conflict.

With the agriculture of these countries more or less paralyzed by the withdrawal of the adult male population, by actual or threatened devastation by hostile armies, and by possible commandeering of farm horses for military and transport work, it will readily be seen that a prolonged struggle must disturb the delicately-adjusted balance of supply

and demand of wheat. Some idea of the vast quantities of wheat normally produced by the belligerent countries may be obtained from a consideration of the normal production per annum for the past ten years. The production for the decennial period 1901-1910 is as follows:—

Russia (in Europe) ...	461	million bushels per annum.
France ...	319	,, ,, ,,
Austria-Hungary ...	213	,, ,, ,,
German Empire ...	133	,, ,, ,,
Balkan Peninsula ...	77	,, ,, ,,
Belgium ...	13	,, ,, ,,
United Kingdom ...	55	,, ,, ,,
	1,271	,, ,, ,,

That is to say, the wheat produced every year in the European countries at war is twelve times as much as the greatest harvest ever reaped in Australia, and thirty-five times as much as Victoria's record wheat harvest. The average total amount of wheat produced in Europe during this period, 1901-1910, was 1,657 million bushels per annum, whilst the total world production for the same period was 3,233 million bushels per annum. *In spite of this stupendous production, Europe's net imports average no less than 244 million bushels per annum, every European country except Russia and the Balkan States being importers* (*vide* Appendix A).

An Era of High Prices.

Now, the amount required to be imported by Europe for the next few years must increase enormously to make up for diminished production, and the huge wastage and loss of foodstuffs caused by the war.

If the wheat-exporting countries of the world—United States, Canada, Argentina, Australia, and India—can rise to the occasion by cultivating greatly increased acreages, the shortage may possibly be made up. If, as is very probable, these countries fail to completely supply the shortage, prices of wheat and foodstuffs in Europe must rise to a level highly profitable to the primary producer in these exporting countries.

Nor will prices drop immediately after the declaration of peace; for experience of previous European wars tends to show that years elapse before normal agricultural production in the countries at conflict is restored.

This may be graphically illustrated by studying the average prices of British corn throughout the great European wars of the past one hundred and fifty years. The accompanying graph has been prepared to show the fluctuations in price of British wheat since the year 1771. The figures have been compiled from the average price of wheat in at least 140 towns in the United Kingdom, and have been extracted from the annual returns of the British Board of Trade.

In studying the returns, it is worth noting that throughout the whole of this period the British Fleet retained the mastery of the seas, and was, therefore, able to draw on more sources of supply than any foreign country.

A careful inspection of the graph will bring out the following general facts:—

1. In times of prolonged peace the fluctuations from year to year are very slight, and prices are relatively low.
2. In times of war the prices fluctuate violently, and, on the whole, are relatively very high.
3. That, concerning the big Continental wars, prices of corn were not restored to a normal level for many years after the declaration of peace.

There are, of course, many complicated factors to take into consideration, *e.g.*, the operation of the Corn Laws from 1771 until their abolition in 1847, the influence of the currency, the abundance or shortage of the home harvests, cost of insurance, and freight, &c. These, *however, do not obscure the three important general conclusions* enunciated above.

It is a coincidence that the price of wheat in Britain in 1779 (4s. 4d. per bushel)—*the lowest price in the history of the subsequent 106 years* —was identical with the price at the commencement of the present European campaign.

The most violent variations in price resulted in the twenty years' war and the Napoleonic campaigns, when wheat reached 15s. 10d. per bushel. This, of course, was the average price for the whole year. Wheat reached much higher prices than this for short periods, *e.g.*, in March, 1801, the price reached 19s. 6d. per bushel.

From 1789 to 1815 were troublous times for Europe. Vide graph for dates and prices. The French Revolution commenced in 1789; the twenty years' war between France and England began in 1793. Corn *averaged 9s. 9d. per bushel in 1796, when the British Government* introduced a system of bounties on imported corn. From 1798 the price shot up to the high average of 14s. 11d. per bushel for 1801. This *period coincided with deficient harvests and the ruinous wars between* France and Germany, Austria and Italy. The victory of Nelson at Copenhagen, in 1801, *led to the opening of the Baltic ports, and a sharp fall in price resulted in 1802.* The peace of Amiens, between *France* and England, was signed in 1802.

France declared war on England in 1803, and an era of high prices again set in. The hostile proceedings of Prussia, at the dictation of France, threatened to cut off supplies from the Baltic, and caused an immediate and great rise in insurance and freight. In consequence of the overthrow of Prussia in the battle of Jena, followed by the Berlin Decree in the autumn of 1806, the price of wheat fell.

In 1808 the Peninsular war commenced, and prices steadily rose to 15s. 10d. per bushel in 1812. France declared war on Russia in 1812, but the war ended in the disastrous retreat of Napoleon from Moscow.

Prices dropped from this extraordinary level (15s. 10d. per bushel for 1812 and 13s. 8d. in 1813) to 8s. 2d. in 1815. There was a rise in prices following the overthrow of Napoleon at Waterloo (1815), as a *result of great scarcity and apprehensions of famine in Germany, France,* and Italy.

In 1822, seven years after the overthrow of Napoleon, the price dropped to 5s. 6d., which was the price at the beginning of the twenty

years' war in 1793. The Napoleonic wars overshadowed in magnitude all those in subsequent history, with the exception of the present conflict, and consequently had more effect on prices than others.

It will be interesting now to observe the effects of other wars on prices. The first important war after the abolition of the Corn Laws, in 1847, was the Crimean war (1853 to 1856). In 1852 the price of wheat averaged 5s. 1d. per bushel. In 1854 the price rose to 9s. 0½d. per bushel, and remained practically stationary for three years, falling to 5s. 6d. in 1858.

The decade commencing in 1860 was a stormy one for the world, a number of minor European wars, the American Civil War (1861-65), and the war between Austria and Prussia (1866) occurring in this interval. Prices rose to a maximum in 1866 (8s. 1d. per bushel), and gradually fell to 5s. 9d. in 1869, when the Suez Canal was opened.

The next decade witnessed the Franco-Prussian war (1870-71) and the Russo-Turkish war (1877). At the beginning of the Franco-Prussian war the price of wheat in London was 5s. 9d., but the following year it was 7s. 4d. per bushel, and remained at this figure for three years, although the war only lasted nine months.

During the Russo-Turkish war the price again rose to 7s. 1d. per bushel (1877), but rapidly fell. From 1880 to 1914 there has been a period of comparative peace, in which great developments were made in transport, methods of cultivation, and in the winning to agriculture of what were hitherto regarded as waste lands. The prices during this period were generally at a low level, and actually averaged 2s. 10d. per bushel in 1894—the lowest price recorded throughout the whole period. No violent fluctuations in price were experienced throughout the entire period. Indeed, for the ten years 1899 to 1908 inclusive the difference between the highest and lowest price for the period was less than 8d. per bushel, the smallest fluctuation in price ever recorded in history.

How War Affects Prices.

There are two causes distinct from each other which contribute to produce an increase in time of war. The economic rise, caused by actual deficiency in the country and by the enhanced cost of transport and insurance; and the psychological rise, due to apprehension and uncertainty in the community as to what is going to happen.

The former rise affects all imported foodstuffs and raw materials equally, but the latter affects foodstuffs principally, for these are of more immediate importance to the community and more likely to become the objects of panic.

The factors affecting the economic rise are the increase in general freights, the heavy rates for insurance, both for vessel and for the cargo, and the influence of a deficient supply. This rise in the price due to increased freights and insurance would not affect imports into the United Kingdom only, but would cause a rise in price of wheat all over the world. War really operates in the same way as a severe crop

failure, producing *pro tanto* a shortage in the world's supply, by obstructing general supplies, increasing the cost of production, and diminishing the amount of production in the countries at war.

There is also the psychologic factor—the uncertainty of what is going to happen. Prices rise on the outbreak and during the continuance of war far higher than can be accounted for by economic causes, and obviously from the nature of the case it is impossible to form any reliable estimate as to its probable extent. *E.g.*, at the outbreak of the Russo-Turkish war there was a sudden jump of 15s. per quarter; also at the time of the Fashoda crisis, in 1898, prices rose 5s. per quarter until the "incident" was settled. Another interesting example of a psychological rise was the unreasoning panic along the American sea-board in the Spanish-American war. This was merely a local alarm that Admiral Cerveras' fleet might raid the coast towns, and was not connected with any dread of interference with the food supply. Its influence was sufficient, however, to cause pressure to be brought on the Government, which adversely affected the strategical disposition of the American Fleet.

The World Harvest for 1914.

Northern Hemisphere.—The wheat crops of the Northern Hemisphere were harvested some months ago. Those of the Southern Hemisphere are about to be garnered. In September, 1914, the International Institute of Rome issued statistics showing the probable harvest of the Northern Hemisphere. From this it would appear that the 1914 crop will be about 8 per cent. less than it was last year. The yield of 1912-13, and the forecast for 1914 crop, is given in Appendix C.

No information is available from Germany, Austria, France, and Roumania regarding the 1914 harvest. Of the other countries, it will be noted that in Russia, Hungary, Belgium, Denmark, Italy, Switzerland, Canada, India, Japan, Algeria, and Tunis the crop is much inferior to last year. By far the most serious shortage is in Russian spring wheat, which is estimated to yield only 72 per cent. of last year's yield. Other important shortages are Canada (68.9 per cent. of last year's crop), India (86.7 per cent.), Italy (80.5 per cent.), Hungary (82.9 per cent.), Algeria (75 per cent.). On the other hand, the United States has had a bumper crop—the highest ever recorded. The crop of spring wheat, however, is only 92.2 per cent. of last year's production. As, however, the winter wheat predominates in acreage, the total amount harvested will be far in excess of last year's production. It is estimated that the United States will reap 123 million bushels over and above the yield of last year's harvest. The only other important countries in which wheat production is in excess of last year's crop are Great Britain (110 per cent.), Spain (107 per cent.), Netherlands (105.9 per cent.), and Russian winter wheat (101.2 per cent.).

The total production in the Northern Hemisphere this year is estimated to be 92.8 per cent. of last year's harvest.

Southern Hemisphere.—So far as the Southern Hemisphere is concerned, it is almost certain that the crop will be far short of normal. Argentina and Australia are the principal producers. In the former

country the crop suffered in the early stages from continuous heavy rains, whilst in Australia the crop has been reduced to less than one-third of last year's production by prolonged drought.

Viewing the world's production as a whole, it would appear that the 1914 crop is less than 90 per cent. of the 1913 crop. There can be no doubt that the bumper crop in the United States has had a steadying effect on the London market quotations up to the present. The numerous cargoes of wheat seized and sold in British ports as contraband of war have also served to steady the price. Moreover, war was declared when the European crop was practically secured, so that many of the Continental countries have from nine to ten months' supply of grain.

The shortage of present production will, therefore, be most keenly felt in Europe next spring, before the crops now sown have been garnered, and it is reasonable to suppose that a higher level of prices will supervene. And what of 1915? How many millions of acres within the area of conflict will be devastated and be rendered barren between this and next summer? and how many wheat-fields outside the actual fighting arena will be unplanted for want of men and boys? What effect will mobilization of 20,000,000 men, a large proportion of whom are drawn from the farms of Europe, have on the world's wheat production?

Even in the neutral European countries—Italy, Roumania, the Balkans, Spain, Netherlands, Switzerland, and Denmark—partial mobilization has taken place in order to guard against possible violation of neutrality. Every producer withdrawn for this purpose becomes a consumer, and possibly a destroyer, of grain. Under these circumstances there can be no possible hope of a normal acreage being sown in Europe in 1915. Nor can we expect that the fields will be tilled with that thoroughness which normally characterizes European wheat farming—where intense cultivation and high yields are a necessity in view of the pressure of population. *Hence a large shortage in European production appears inevitable next season, and this, following on the heels of a short crop for 1914, will make the position critical at the beginning of 1916, when the next Australian harvest becomes available.*

The Wheat Growers' Great Opportunity.

From the foregoing observations it appears that an era of high prices for wheat is likely to be ushered in—prices which must prove highly remunerative to the wheat growers. What, then, should Australia do to make the most of these high prices and to safeguard the interests of the Empire so far as lies in her power? The farmers, the Governments, and the financial institutions should co-operatively endeavour to secure that the maximum area possible should be sown next autumn with wheat. There are, indeed, several cogent reasons why Australia's attention should be focussed rather on the 1915 seeding than on the following year. The seeding of winter wheat has been completed in the Northern Hemisphere, and, though, naturally, every country outside Europe would endeavour to sow as much wheat as possible, there was insufficient time between the outbreak of hostilities and seeding to permit of much more

than the usual acreage being prepared. On the other hand, Australia has five clear months before the seeding season arrives, and there is ample time to make adequate and thorough preparation for the largest seeding on record.

Again, though a study of Australian rainfall records does not reveal any regular cycles of good and bad seasons, it does seem that extreme droughts are followed by seasons of abundant rainfall. This was notably true of the years 1889 and 1903, following the droughty years of 1888 and 1902, the only years comparable with the present year, and 1889 and 1903 were seasons of abundant rainfall. If history repeats itself on this occasion, the harvest should be one of the most prolific on record.

How to Secure a Maximum Acreage for Seeding.

In the endeavour to secure a maximum seeding for 1915, much will depend on the attitude (*a*) of the individual farmer, (*b*) the Government, (*c*) the financial institutions, and, last but not least, the acreage sown will depend very largely on the rainfall between now and seedtime.

Let us consider these factors in the situation—

(*a*)—*The Farmer's Probable Response.*

It is to the farmer we must look primarily for an extension of the acreage cropped. Unless he is firmly convinced of the possibilities of the position, his response will not be marked. If he can feel satisfied that the price is likely to be high, that he will be allowed absolute freedom to dispose of his wheat in the dearest market without artificial restrictions in the shape of fixed prices, his response is likely to be eminently satisfactory.

Consider, for example, the farmer who follows a typical rotation of wheat, grass, and bare fallow. Under normal conditions, less than one-third of his holding is sown each year with wheat. But, in view of the special circumstances this season, such a farmer might be induced to put in at least one-half, possibly two-thirds, of his cultivable area. The whole of the land normally fallowed would be sown to wheat next autumn; but, in view of the special circumstances, and in view, too, of the drought which has prevailed during the past six months, he would be justified in working up a large portion of his stunted crop, treating it as a fallow, and sowing it again next autumn. Nor need much be expended in the way of immediate preparation. The use of the disc or the tine cultivator in many soils could be substituted for ploughing, and the necessary tilth could be obtained with subsequent harrowings.

Indeed, since the rainfall in our wheat areas during the past six months has been practically nil, the land so worked up would be practically fallow land. In the majority of cases the soil is now in much the same condition as it was at seedtime. The stunted crop will have made but very little drain on the soil resources, and the use of the disc, and subsequent use of the harrows, will bring it into good condition for seeding. The ordinary fallow this year, owing to the dry winter, will have very little advantage over worked-up stunted crop land. In any

case, the disced land will not require such a heavy dressing of superphosphate next autumn, as the greater part of the superphosphate applied last autumn will be present in the form of "reverted phosphate," in which form it is available for crops.

Again, many of the larger farmers, with holdings ranging over 1,000 acres, rarely put in more than one-quarter to one-fifth of their cultivated areas. With the present inducement—namely, the probability of an inflated price far in excess of anything obtained for the last forty years—they should certainly cultivate a much larger proportion of their holdings.

The large land-owners and graziers of Australia could make a more material contribution to increased acreage than any other section of the community. Consider, for example, the case in Victoria. There are 1,677 holdings varying from 2,000 to 50,000 acres each in area. The average size of these 1,677 estates is 7,176 acres. The amount of land privately owned in these estates is nearly 9,000,000 acres, whilst the total land held under Crown lease and privately exceeds 12,000,000 acres. Of this total only 595,815 acres are under cultivation. Much of this land is, of course, remote from the railway and suitable only for grazing. On the other hand, there is a fairly large portion, particularly in the Western District, that is suitable for wheat growing.

It is to be hoped that these large land-owners will endeavour to prepare a fair portion of their holdings for the coming seeding, for patriotic as well as purely personal interests, either by cultivating it on the share system or by tackling wheat growing themselves.

If the summer and autumn rains are at all favorable, and a break in the existing droughty conditions thus definitely established, confidence in the outcome of the next season will be engendered.

What acreage may reasonably be expected for Victoria under these conditions? The present wheat crop (exclusive of hay) averages 2,500,000 acres, of which 1,500,000 acres are sown on well-prepared fallow, and 1,000,000 acres on autumn-ploughed grass and stubble land. In addition to these normal quantities it may be said that at least two-fifths to one-half of the present stunted crop could, and should, be worked up and got ready for autumn seeding. This would equal 1,100,000 acres. For virgin land and induced extra sowings on the part of large farmers and farmer-graziers, we may add 500,000 acres. This totals 4,100,000 acres, and, with a 12-bushel average, the total yield would be, approximately, 50,000,000 for Victoria, the cash value of which, at 5s. per bushel, would exceed £12,500,000.

(b)—Attitude of the Government.

One of the most helpful factors in inducing farmers to go in for larger acreages would be a positive assurance in advance from the Government that the price of wheat will not be fixed—that the farmer will be at liberty to sell his goods in the dearest market. He had to sell his wheat at 1s. 9d. per bushel in 1894 and 1895—a price at which there was no profit to be made. If it is logical to fix the price when, owing to the operation of the law of supply and demand, prices are rising, it

is equally logical to fix prices when the cash value of our staple commodity falls below the level at which it can be grown at a profit. Such negative assistance is all that the majority would require.

There are many, however, who will require financial assistance to see them through the seeding. Among these are a number of farmers in the newly-opened-up Mallee areas who have run the gauntlet of bad seasons in their attempts to transform the wilderness of the Mallee to fields of waving corn. With no reserves of feed to fall back on, the present season finds them in a critical position, and practical assistance in the shape of supplies of fodder and seed wheat is necessary to tide them over. This assistance the Government has arranged to give, and money for fodder and seed wheat will be advanced on loan for those in need of it.

The temporary abolition of the duty (29s. 4d. per ton) on fodder from New Zealand should also be considered, in view of the present scarcity and high price in Victoria. In New South Wales the Government is contemplating guaranteeing a minimum price of 4s. per bushel for next season's wheat, but it is not likely that this will involve the Government in any expenditure, since it is almost certain that the price of next year's wheat will be far above 4s. per bushel.

(c)—*Attitude of the Financial Institutions and Business Houses.*

It is to be hoped that the farmer may again appeal with confidence to business houses and financial institutions during the coming year. The business houses have been of invaluable assistance to him in riding over bad seasons in the past by supplying machinery, implements, fertilizers, stores, &c., on long and, on the whole, reasonable terms. To cope with the probable increased acreage, considerable credit will require to be extended to the farmers in view of the disastrous season through which they have just passed. These houses should face the situation boldly, recognising that even a moderate season must bring great prosperity to the primary producers, and that the extent of many of the farmers' response to the opportunity presented will largely depend on the extent to which the commercial and financial houses respond to appeals for extra assistance.

(d)—*The Probabilities of a Good Season.*

The season of 1914 will probably be remembered in our agricultural history as being one of the severest droughts ever experienced throughout the wheat belt of Australia. Throughout the entire winter and spring the rain-bringing Antarctic disturbances, which usually course from west to east across the temperate portion of the continent, have kept hundreds of miles south of their usual track, with the result that the wheat-growing areas of the Commonwealth have received barely sufficient rain to germinate the seed, much less bring the struggling crops to maturity. At Echuca—a centre typical of our northern country—and a large area of the Riverina, less than 2½ inches have fallen from May to October inclusive, whereas the normal fall for the period is over 10 inches. Western Australia, South Australia, Victoria, and southern New South

It is in seasons such as these, though, happily, they occur but rarely, that the confirmed pessimist may question the wisdom of opening up of semi-arid areas on the margin of existing cultivation. Such extension, it might be argued, is full of risk, and in a dry season may lead to wholesale abandonment of hard-won settlement. But a careful study of past records proves that years such as we are passing through are unique in Australian history—that while a year of scanty rainfall does occasionally occur, the vast majority of seasons are such as to make success certain where skill and judgment are displayed in cultivation. Even this year, undoubtedly the severest season within living memory, there are, north of the Dividing Range, individual instances where good crops are being reaped, though practically no rain has fallen from seeding to harvest.

One gratifying feature of the last decade is the gradual subjugation of our dry Mallee areas and the steady march of the plough towards the interior of the continent. Lands which, a decade ago, were regarded as beyond the limit of safe cultivation, are now producing millions of bushels of wheat annually, and the "unsafe" lands of to-day will undoubtedly be the granaries of to-morrow. Picturesque confirmation of this belief is to be found in the hundreds of applications for a few newly-gazetted Mallee blocks in the midst of this—the driest season on record! It is a truism in regard to weather and climate that "What has been, will be," and if we have had cycles of good seasons in the past we may confidently expect them in the future. Unfortunately, meteorological science has not yet progressed sufficiently far to enable reliable long-range weather forecasts to be made with confidence, nor does a survey of available past records of Australian rainfall reveal any regularity in the sequence of good and bad seasons. But this much does seem to be true—that our really lean years are followed by good summer rains and by a year of exceptional productivity. This was notably the case after 1902 and 1888, the two driest seasons during the past quarter of a century (*vide* Appendices D and E).

Monsoonal influences have already been operating from the north-west, and substantial falls have been registered in South Australia and parts of New South Wales. Should these monsoonal influences continue, and enable the subsoil to become well soaked, the prospect of the autumn-sown crop will be greatly enhanced.

The marvellous recuperative powers of the soil after a drought are well known. The enforced rest from crop production enables soluble plant food to be developed within the soil in large quantities, and even moderate rainfall in the following year results in an unexpectedly large crop.

Thorough Working an Essential for the Highest Yields.

Though it is to the farmers' interest to sow as much as possible next season in order to reap the full benefit of the high prices that must rule for wheat, the question of thorough working should certainly not be lost sight of, and a word of warning must here be given.

Never was there greater need to cultivate the land thoroughly than at the present time. We have passed through the driest season in living

memory, and the soils and subsoils have slowly and gradually become denuded of soil moisture. Every inch of rain that falls from now till seedtime needs to be jealously guarded and stored in the soil for the future use of the crop. Why? Careful tests have conclusively shown that an equivalent of 4 inches of rain must pass through the growing crop to produce a 12-bushel crop of wheat. Every inch of rain that can be made available to pass through the crop means at least one extra bag of wheat per acre to the farmer. On the other hand, every inch of rain lost by carelessness in cultivation, or from want of cultivation, means the loss of a bag per acre. Only on the fallow lands and on the well-worked-up soils can moisture be effectively stored. Pasture and grass lands intended for seeding in the coming autumn should be worked up as soon as they are in a fit condition for ploughing; and, if ploughing moist land during the summer or early autumn, let the harrows, or, if necessary, the roller and harrows follow the plough as soon as possible, so as to break down the soil in the minimum of time, and save as much moisture for the next season's crop as possible. Soil moisture is the one thing needful in Australian agriculture, and the past season has given us many striking illustrations of the fact. Throughout the length and breadth of Australia the crops sown on well-worked land stand out in marked contrast from those sown on indifferently-cultivated soils. Thorough working always pays, but its effects are always more noticeable in a dry season than a wet one. It will be the more necessary for the coming crop, because the absence of heavy soaking rains this season has hampered the production of suitable soil tilth.

Effect of Good Prices on Australia.

The normal wheat production of Australia is approximately 100,000,000 bushels, with an average price of 3s. 6d. per bushel, the total value of the crop is, in round numbers, £17,000,000. Every extra shilling per bushel received for wheat means an extra £5,000,000 to the Commonwealth. The London parity for wheat is at present about 5s. per bushel f.o.b. Australian ports, and it is very unlikely that the price will drop below this figure during the currency of the war. Indeed, as has been shown above, the tendency rather would be for the wheat to rise beyond this even after the restoration of peace. A normal harvest would, under these circumstances, bring in at least £25,000,000, whilst a good harvest in 1915 over the extended acreage should exceed £30,000,000.

The effect of such bountiful primary production on trade and manufactures would be immense, and would aid in counteracting the inevitable depression of trade which economists anticipate will result after the present artificial boom caused by trade in war supplies slackens. All available capital in the Old World will be needed at the close of the war for the repairing of the enormous wastage caused by the present conflict, and Australia, in common with other exporting agricultural countries, will need to place more reliance on her agricultural industries to weather this anticipated trade depression. With the prospect of high and remunerative prices for her staple crop, her position is such as to become eminently satisfactory if the effort suggested throughout this article is made.

APPENDIX A.

Table showing Total Production of Wheat in each of the Continents of the World, and the Net Imports and Exports of the Principal Wheat Countries for the past three decades:—

Countries.	Average Total Production, in Million Bushels.			Average Net Imports or Exports, in Million Bushels. Wheat and Flour.		
	1881–90.	1891–00.	1901–10.	1881–90.	1891–00.	1901–10.
United Kingdom .	76	60	55	Imp. 144	Imp. 177	Imp. 209
France	301	305	319	Imp. 39	Imp. 36	Imp. 10
German Empire ..	104	125	133	Imp. 18	Imp. 41	Imp. 70
Austria-Hungary ..	161	186	213	Exp. 11	Exp. 1	Imp. 3
Russia in Europe ..	244	300	461	Exp. 87	Exp. 104	Exp. 142
Scandinavia .. .	4	5	6	Imp. 4	Imp. 7.2	Imp. 11
Iberian Peninsula .	(107)	(99)	131	Imp. 9	Imp. 10	Imp. 12
Italian Peninsula ..	118	125	163	Imp. 23	Imp. 22	Imp. 38
Balkan Peninsula .	(76)	(74)	(77)	..	..	Exp. (2)
Roumania	(42)	52	73	Exp. 21	Exp. 27	Exp. 42
Belgium	18	16	13	Imp. 21	Imp. 34	Imp. 46
Holland	6	5	5	Imp. 11	Imp. 15	Imp. 20
Switzerland	3	4	4	Imp. 12	Imp. 15	Imp. 17
Denmark	4	4	4	Imp. 0	Imp. 2	Imp. 4
EUROPE	(1,264)	1,358	1,657	..	..	..
Russia—						
Russia in Asia ..	(74)	100	155	..	..	..
India	259	243	294	Exp. 33	Exp. 23	Exp. 27
Japan	13	19	20	Imp. 0	Imp. 1	Imp. 5
Persia	(22)	(19)	(16)	..	..	..
Turkey in Asia ..	(45)	(45)	(35)	..	..	Exp. 3 In good years
ASIA	413	426	520	..	..	..
Dominion of Canada ..	38	55	110	Exp. 2	Exp. 13	Exp. 42
United States ..	427	559	657	Exp. 116	Exp. 178	Exp. 125
Mexico	(12)	12	10	..	..	Imp. (1)
NORTH AMERICA	477	626	777	..	..	..
Argentine	24	65	130	Exp. 4	Exp. 37	Exp. 84
Chili	(12)	14	16	Exp. 4	Exp. 4	Exp. 2
Uruguay	(4)	6	7	Exp. 0	Exp. 2	Exp. 1
SOUTH AMERICA ..	40	85	153	..	..	..
Algeria	(21)	24	33	..	Exp. 2	Exp. 4
Tunis	(5)	6	7	..	..	Exp. 1
Egypt	(12)	(13)	(20)	Imp. 0	Imp. .1	Imp. 6
Union of South Africa	(2)	(2)	3	..	..	Imp. 8
AFRICA	(40)	45	63	..	..	..
AUSTRALIA	27	30	56	Exp. 6	Exp. 6	Exp. 28
NEW ZEALAND ..	8	7	7	Exp. 3	Exp. 1	Exp. 1
AUSTRALASIA ..	35	37	63	..	..	..
THE WORLD ..	2,269	2,577	3,233	..	..	..

Figures in brackets indicate that official statistics were not available.
For all figures not enclosed in brackets official statistics were used in compiling returns.

NOTE TO APPENDIX A.

This table summarizes the progress of the wheat industry in the more important countries of the world for the past three decades.

It is interesting to note—

(1) That Europe has consistently supplied more than half the world's wheat for the past three decades.

(2) Russia and Roumania have materially increased their wheat production during the last three decades. The production of the United Kingdom has shown gradual diminution, whilst that of the other European Powers has remained practically stationary. Russia and the Balkans are the only exporters of wheat in Europe, all other countries being large importers.

(3) The greatest developments have taken place in United States, Argentina, Canada, and Australia, and these are the only countries that can materially expand in production.

(4) That while the United States production has enormously increased, during the last twenty years her average exports of wheat have fallen (*e.g.*, from 178 to 125 million bushels), owing to the growing needs of her rapidly increasing population, and she is gradually losing her position as a controlling factor in the world's wheat market.

APPENDIX B.

TOTAL WHEAT PRODUCTION OF THE WORLD FOR THE PAST 25 YEARS.

1st Quinquennium.		2nd Quinquennium.		3rd Quinquennium.		4th Quinquennium.		5th Quinquennium.	
	Million Bushels.		Million Bushels.		Million Bushels.		Million Bushels.		Million Bushels.
1888 ..	2,252	1893 ..	2,544	1898 ..	2,916	1903 ..	3,189	1908 ..	3,271
1889 ..	2,174	1894 ..	2,602	1899 ..	2,612	1904 ..	3,152	1909 ..	3,724
1890 ..	2,296	1895 ..	2,435	1900 ..	2,616	1905 ..	3,321	1910 ..	3,658
1891 ..	2,464	1896 ..	2,376	1901 ..	2,765	1906 ..	3,435	1911 ..	3,689
1892 ..	2,502	1897 ..	2,280	1902 ..	3,072	1907 ..	3,108	1912 ..	4,018
Average for five years, 1888–92	2,338	Average for five years, 1893–97	2,448	Average for five years, 1898–02	2,796	Average for five years, 1903–07	3,241	Average for five years, 1908–12	3,672
Average price per bushel	4s. 0¼d.	Average price per bushel	3s. 2¾d.	Average price per bushel	3s. 6½d.	Average price per bushel	3s 7d.	Average priec per bushel	4s. 2d.

NOTE TO APPENDIX B.

This table (*compiled from statistics issued by Broomhall and Dornbusch*) summarizes the total world production of wheat for the past quarter of a century. Observe the gradual and steady increase in production throughout this period. Though production in 1912 was nearly double what it was twenty-five years ago, yet the average price of wheat has, on the whole, steadily increased during this period (*vide* chart showing prices of corn in London, 1771-1914), showing that the *demand* for wheat is increasing at a *more rapid rate* than its production.

Appendix C.

FORECAST OF WHEAT HARVEST OF COUNTRIES OF NORTHERN HEMISPHERE, 1914.

(Compiled from statistics issued by International Institute of Agriculture, Rome, Sept., 1914.)

Country.	Production in Bushels.		Percentage Production on previous year.
	1913–14.	*1912–13.*	*1912–13 = 100%*
Europe—			
Germany	..	170,873,585	..
Austria	..	59,555,097	..
Hungary	125,290,518	151,168,166	82·9 %
Belgium	13,955,905	14,751,583	94·6 %
Bulgaria	..	60,555,000	..
Denmark	4,871,737	6,687,007	72·9 %
Spain	120,171,114	112,268,208	107·0 %
France	..	318,992,913	..
Great Britain	62,117,682	56,628,467	110·0 %
Italy	172,490,000	214,151,840	85·0 %
Netherlands	5,373,522	5,075,301	105·9 %
Roumania	..	84,091,957	..
Russia in Europe—			
(*a*) Winter Wheat ..	296,690,114	293,138,082	101 2 %
(*b*) Spring Wheat ..	380,923,275	541,697,292	72·0 %
Switzerland	3,405,760	3,504,850	97 2 %
America—			
Canada	159,472,752	231,445,243	69·9 %
United States—			
(*a*)	674,323,223	522,946,968	128·9 %
(*b*)	220,730,811	239,537,740	92·2 %
Asia—			
India	314,233,711	362,261,005	86·7 %
Japan	23,843,660	25,896,907	92·0 %
Russia in Asia	..	189,638,632	..
Africa—			
Algeria	11,010,000	14,680,000	75·0 %
Egypt	..	38,380,860	..
Tunis	2,202,000	5,505,000	40·0 %

Note to Appendix C.

This table represents the latest, and probably the most reliable, forecast of the wheat harvest of the Northern Hemisphere. The table is a summary of the statistics published by the International Institute of Agriculture, Rome, on 14th September, 1914.

The interesting feature in the table is that the majority of the wheat countries of the Northern Hemisphere show crop shortages as compared with the previous year. The most serious shortages are in—Russia (spring wheat), 72 per cent. of last year's production; Hungary, 82.9 per cent.; Italy, 85 per cent.; Canada, 69.9 per cent.; India, 86.7 per cent.; Japan, 92 per cent.; Algeria, 75 per cent. On the other hand, Great Britain (110 per cent.), Spain (107 per cent.), and United States of America (winter wheat) (128 per cent.), show considerable increases.

The total crop of the Northern Hemisphere is only 92 per cent. of what it was last year. America's "bumper" crop saved the situation and the price. Had it not been for the excellent American crop, which was the best ever harvested, prices would undoubtedly be much higher than they are to-day.

Regarding the Southern Hemisphere, Argentina will probably have less than last year, on account of prolonged wet weather; Australia less than one-third of last year's production, on account of prolonged drought.

The world's production this year, therefore, will be about 90 per cent. of last year's production.

Appendix D.

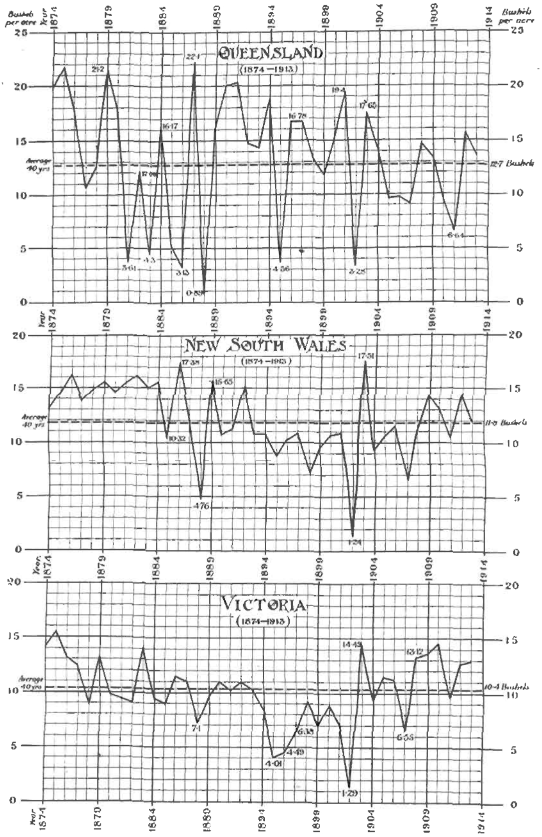


Chart showing fluctuations in annual yield of wheat per acre in Queensland, New South Wales, and Victoria for past 40 years, compared with the average yield for the same period.

APPENDIX D—*continued.*

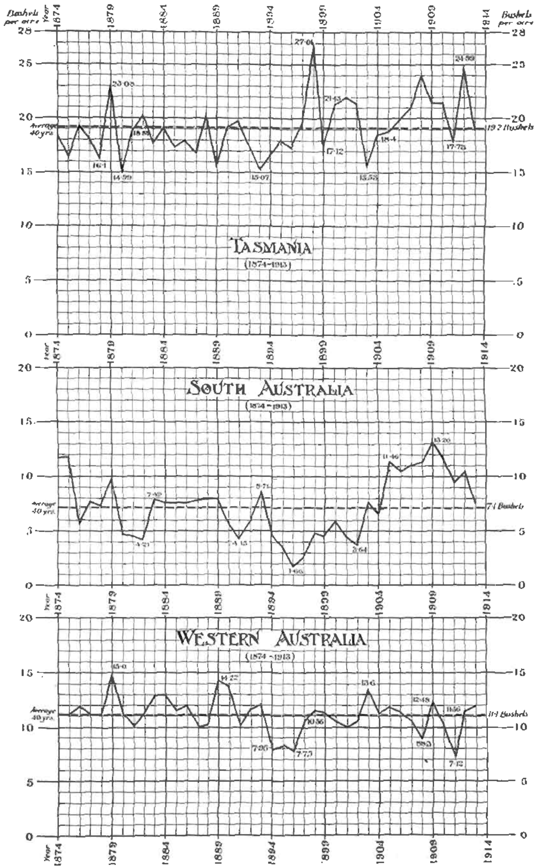


Chart showing fluctuations in annual yield of wheat per acre in Tasmania, South Australia, and Western Australia for past 40 years, compared with the average yield for the same period.

Note to Appendix D.

This summarizes in graphical form the average yield of wheat per acre, obtained over a period of forty years, in each State of the Commonwealth.

Of the six States, it will be noted that the least fluctuation in yield is shown by Tasmania and Western Australia; the greatest by Queensland. For the period under review the yield in Tasmania has never fallen below 14 bushels, nor has Western Australia fallen below 7 bushels. The average yields throughout the entire period were 19.2 bushels and 11.1 bushels respectively. On the other hand, Queensland has had a series of remarkably good seasons, and a number of extremely bad ones—if we judge the nature of the season by the size of the crop.

In South Australia, there is a more or less cyclical alternation of good and bad seasons, and the average yield for the period is 7.1 bushels. *In New South Wales, Queensland, and Victoria, it appears that extremely bad seasons are followed by seasons of high productivity.* This is true of the only two bad seasons experienced in New South Wales, viz., 1888 and 1902. In 1888, the yield was 4.76 per acre, and in 1902, 1.24 bushels per acre. These were followed by yields of 15.65 bushels and 17.51 bushels per acre.

In the case of Queensland this is true in seven cases out of eight. Thus 1881 (3.61 bushels per acre) was followed by a yield of 12.08 bushels; 1883 (4.3 bushels) was followed in 1884 by a yield of 16.17 bushels; and 1886 (3.13 bushels) was followed by the record yield of 22.1 bushels. 1895 (4.56 bushels) was followed by a yield of 16.78, and 1902 (3.28 bushels) by a yield, in 1903, of 17.65 bushels, and 1911 (6.64 bushels) by a yield of 15.81 in 1912.

The one exception in the forty-years period was in 1885, when a yield of 5.11 bushels was followed by a yield of 3.13 bushels.

Turning to Victoria, it would appear that she has had six bad seasons during the forty-years period, namely, 1888 (7.10 bushels), 1895 (4.01 bushels), 1896 (4.49 bushels), 1902 (1.29 bushels), 1907 (6.55 bushels), and the present year (1914).

In four of these—1888, 1896, 1902, 1907—the following years enjoyed good winter rainfalls and good crops, whilst one (1895) was followed by a relatively low winter rainfall.

This comes out more clearly in Appendix E, which shows the relation between the composite winter rainfall of four representative wheat centres and the average yield per acre.

The average yields for Queensland, New South Wales, and Victoria are respectively, 11.8 bushels, 12.7 bushels, and 10.4 bushels.

Appendix E.

(*See next page.*)

Notes to Appendix E.

This chart represents, in graphical form:—

(1) The average wheat yield of Victoria for the past thirty years.

(2) The relation between the average wheat yield and the winter rainfall.

(3) The increasing efficiency of Victorian agriculture.

Consider these points seriatim:—

1. *The Average Wheat Yield.*—In considering the average wheat yield of this period it is necessary to bear in mind that the acreage under crop has been steadily increasing, and that poorer and more arid areas have been gradually brought under cultivation. Consequently, it might be expected that the average yield would show a gradual falling off towards the end of the period. As a matter of fact, the average yield has steadily improved, in spite of the extension of the cultivation area into these new districts. In looking at the graph it appears that the worst seasons experienced during the three decades under review were 1888, 1895, 1896, 1902, 1906, when the average yields were respectively 7.10, 4.01, 4.49, 1.29, and 6.55 bushels per acre.

Following four of these dry years, the succeeding years' averages were, respectively—9.75 bushels (1888), 6.38 bushels (1897), 14.4 bushels (1902), and 13.12 bushels (1907); whilst on one occasion (1895) the following year yielded 4.49 bushels. That is to say, in four out of five dry seasons good to excellent crops followed a dry year, whilst only on one occasion the dry year was succeeded by a second dry year.

Appendix E.

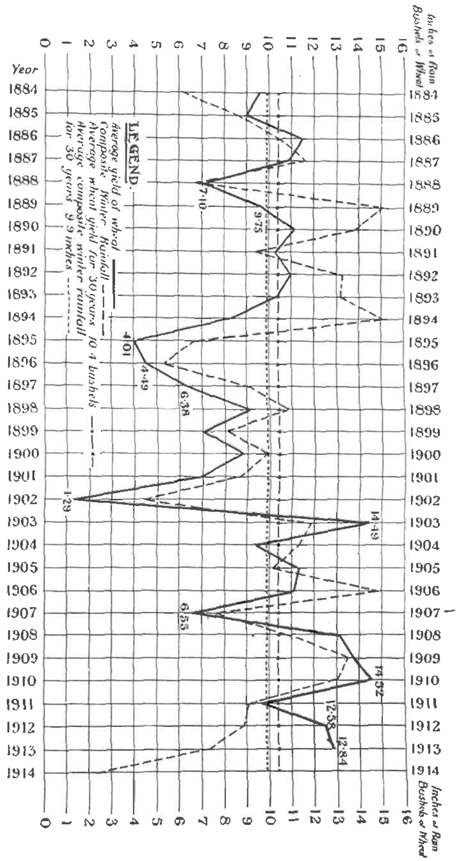


Chart Showing
Average Yield of Wheat in Victoria for 30 Years.
Composite Winter Rainfall at Bendigo, Echuca, Horsham & Mildura.
Relation between Average Yield & Winter Rainfall.

1914 has been the severest drought on record, so far as Victoria is concerned and while it is somewhat risky to draw deductions in matters of meteorology, a review of the dry seasons in the three eastern States appears to show that extremely dry seasons are almost invariably followed by a season with a good autumn and winter rainfall.

This observation finds more striking confirmation than a study of average wheat yields of Victoria appear to indicate.

2. *The Relation between the Average Wheat Yield and the Winter Rainfall.*—For example, if the winter rainfall (May to October) at a number of representative centres be taken, and their composite averages plotted side by side with the average wheat yield of the State, an interesting relation appears to be established.

For this purpose, the rainfall records at Mildura, Horsham, Bendigo, and Echuca have been taken, and the composite winter rainfall—*i.e.*, May to October—at each centre has been averaged for a period of thirty years. Mildura and Horsham have been taken as representing the Mallee and Wimmera respectively, whilst Bendigo and Echuca may be regarded as representative of the Northern and Goulburn Valley areas. These towns were chosen because the rainfall records have been kept for a longer period than at other towns. These four areas represent 90 per cent. of the wheat belt of the State. The rainfall between 1st May and 31st October has been taken each year for each centre and averaged. The composite average so obtained is called the "Winter Rainfall," and the amount in inches is plotted on the same scale as Victoria's average wheat yield in bushels.

A close examination of the graph will show that, except in seasons of exceptionally heavy winter rainfall—*e.g.*, 1889, 1893, 1903—there is a remarkable parallelism between the wheat yield and the composite winter rainfall. Indeed, from 1894 to 1911, the graph of winter rainfall in inches almost agrees with the graph of the average wheat yield in bushels.

If the figures for a greater number of centres were taken doubtless the parallelism would be even more marked. But the main interest of the graph is that it brings out very clearly the improvements in the methods of agriculture during the last seven years.

3. *The Increasing Efficiency of Victorian Agriculture.*—Consider, for example, the period of years from 1888 to 1902. Observe the relative positions of the graph for rainfall and the graph for average yield. With the single exception of the year 1891, the line of rainfall lies considerably above the line of yield. From 1903 to 1907 is a transition period, when on two out of five occasions the wheat yield line was above the composite rainfall line. From 1907 till 1913 the rainfall line has been consistently below the wheat yield line. In other words, the farmer is getting far more wheat from an inch of rain now than at any previous period in the history of wheat growing in Victoria, thanks to the use of superphosphates, moisture-saving fallows, and more thorough methods of cultivation. Whereas, prior to 1902, he secured considerably less than 1 bushel of wheat for every inch of winter rainfall, now he is securing considerably more than a bushel for every inch of winter rainfall.

[Incidentally, it may be remarked that the fair approximation of the average yield of the State in any one year could be forecasted by taking the composite winter rainfalls of these four centres and reckoning 1 bushel of wheat for every inch of useful rain. Possibly the composite average of a large number of centres would make the approximation much closer.]

Again, consider the rainfall during the period, 1903 to 1913. The seasons were obviously much drier than the corresponding period from 1886-1896, and yet the average yields per acre are incomparably better, in spite of the fact that hundreds of thousands of acres of dry Mallee country have been added to the wheat belt during the last eleven years.

Finally, as regards the prospects for next season. We are, of course, on the knees of the gods. But consider the graph of winter rainfall on this chart. In the four dry years—1888, 1896, 1902, 1907—the succeeding winter rainfall was in every case better than that of the three good seasons prior to the present drought. Only on one occasion throughout the period—1895—was a dry season followed by a still drier season.

The odds, then, are in favour of a heavy winter rainfall next year, and if, betwixt this and seeding, good summer and autumn rains occur, enabling moisture to be conserved in the soil, the prospects of a good crop next year would seem to be eminently favorable.

CUTWORM CATERPILLARS DESTROYING ONION, TOMATO, MAIZE, AND POTATO CROPS.

By C. French, Junr., Government Entomologist.

During the last few months, these destructive insects have made their appearance in various parts of the State, particularly in the Western District, and have caused considerable losses to the growers.

Recently, I paid a visit to Warrnambool and the surrounding country, and was surprised to see the extent of the damage done. At the present time, large onion crops are cultivated in that district, and, on examination, I found that several large patches were completely eaten out by the cutworm pest. On removing the soil from one plant, no less than eleven cutworms were found underneath it. This shows the vast number there would be in a crop thoroughly infested. The grubs remain in the soil during the daytime, and come out during the night to feed.

From reports received from other parts of the State, tomato, maize, and potato crops are being affected in the same way. Unless active measures are immediately taken to suppress this pest, there will be a greatly diminished production of onions, potatoes, and tomatoes this year. Fruit and fruit trees are also being attacked, but a good spraying with arsenate of lead will rid the trees of this trouble.

I have been recommending the poisoned bran mash as a remedy, and from the reports received from the growers, I find that it has been very successful. The *Colac Reformer*, referring to these insects, stated a few days ago, "that they come out in millions after the mixture, and readily take the deadly bait." It further states, "that after the first experiment with this mixture, millions of the cutworms were to be found dead in the onion fields."

The following is the formula for the poisoned bran mash:—Obtain 10 lbs. bran, 4 lbs. molasses, and 4 ozs. paris green, and make it into a paste or dough, then place small pieces amongst the crops. This bait is greedily eaten by the caterpillars, and after a few hours they die.

Another useful bait is to cut up into small pieces any available greenstuff, and dip it into paris green or arsenate of lead. It could then be spread amongst the crops, but care should be taken to keep stock off the ground where the poisoned baits have been placed.

Correspondents have frequently inquired whether there is any likelihood of vegetables absorbing paris green from the mash when placed near the roots. I am instructed by the Chemist for Agriculture that there is no danger, as the paris green is practically insoluble, and, therefore, cannot be absorbed by the plants.

Pamphlets containing full information regarding the life-history, and the best remedies for the suppression of these insects can be had gratis from the Department of Agriculture.

BEE-KEEPING IN VICTORIA.

(*Continued from page 618.*)

By F. R. Beuhne, Bee Expert.

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

THE SILVER TOP (*Eucalyptus Sieberiana. F. v. M.*)

This tree is variously known as Mountain Ash, Ironbark, and Silver Top Ironbark. It is tall with a dark fibrous bark. The leaves of mature trees are lance-shaped, slightly curved, with the marginal vein removed from the edge and the veins fairly prominent. The sucker leaves are oblique, egg-shaped, and about 3 inches long, or lance-shaped curved, and up to over 6 inches long. The buds are club-shaped, numerous in an umbel, the fruit pear-shaped.

The timber is light in colour, not hard, usually straight, and free in grain, easily worked, and extensively used for railway sleepers, palings, shingles, spokes, and recommended for shafts, &c.

As the Silver Top grows in Gippsland in districts not at present used for commercial bee-keeping, nothing is known about it from the apiarist's point of view, and information cannot, therefore, here be given as to the amount and character of honey produced by this tree nor its normal flowering and the length of time it is in bud.

THE MAHOGANY GUM (*Eucalyptus botryoides—Smith*).

Fig. 7.

The Mahogany Gum, Bastard Mahogany or Bangalay, when growing on elevated ground is a fine upright tree with a straight trunk of large dimensions, and is of very rapid growth. On low ground and banks of creeks it is usually gnarled. The bark is red coloured, short grained, flaky, and brittle. The timber is hard, close grained, red coloured, and very durable, used for felloes of wheels, ship building, &c.

The leaves are broad lance-shaped, about 6 inches long, shining on the upper surface; the veins well marked, fine, and numerous, with marginal vein very near the edge. The buds and fruits are compact, elongated, and characteristic of the species.

In Victoria it is found in Gippsland (Croajingolong), and nothing definite is as yet known of its value to the bee-keeper as a nectar or pollen producer.

THE WOOLLY BUTT (*Eucalyptus longifolia. Link*).

Fig. 8.

The Woolly Butt is a tall tree with a grey fibrous bark extending to the upper branches, which are smooth. The durable and very valuable timber varies from a light colour to dark red in colour, hard, and cross-grained. The leaves are lance-shaped, often 12 inches in length, not shining, the veins well marked with the marginal vein rather close to the edge. Buds, flowers, and fruits comparatively large, occur mostly in threes on rather long stalks and stalklets.

This is a beautiful foliaged partially deciduous tree growing on the eastern extremity of Gippsland, extending into Victoria from New South Wales. Nothing is so far known as to its value to the bee-keeping industry.

THE GREY BOX (*Eucalyptus hemiphloia*).

Fig. 9.

This tree is known in different parts of the State as Grey Box, Box, White Box, and Black Box, usually in consequence of the lighter or darker colour of the bark produced under different conditions of climate and soil.

Fig. 6.—The Silver Top (Eucalyptus Sieberiana, F. von M.).

It is as a rule not a large tree, attaining a height of 80 to 100 feet with a maximum of 140. The bark is from light to dark-grey, but slightly furrowed, and extends to the base of the branches, which are smooth or with a flaky bark. The leaves are broad lance-shaped, sometimes up to 5 or 6 inches in length, thick and rigid and greyish on both sides. The veins of the leaves not prominent, the lateral ones

oblique, the marginal ones somewhat removed from the edge. The flowers are mostly in umbels of four to eight on the same season's new wood, and, therefore, projecting mostly beyond the older foliage, and making the flowering tree very conspicuous. The buds are conical, and become first visible from three to six months before flowering, which occurs from February to June, varying in different districts and in different seasons. The fruit is cylindrical and rather small.

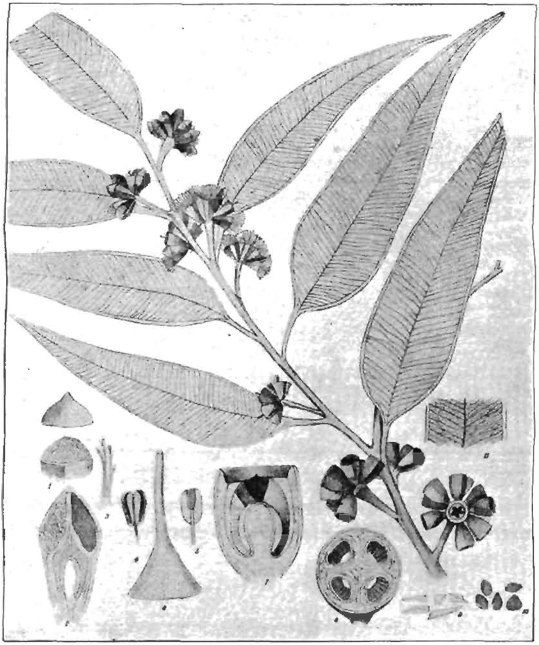


Fig. 7.—The Mahogany Gum (Eucalyptus botryoides, Smith).

The timber is pale, hard, durable, and highly valued for railway sleepers, telegraph pole, mining props; also extensively used as firewood. The Grey Box is widely distributed over Northern and Western Victoria, occurring within 10 miles of Melbourne, but absent in country with a rather heavy rainfall and in Gippsland, the tree known there as Grey Box being E. Bosistoiana. It is usually found growing in company

with Yellow Box, Red Box, Stringy Bark, or Long-leaved Box, and near the Mallee with Yellow Gum and Black Box (E. bicolor). To the bee-keeper it is one of the most important and useful Eucalypts, being very regular in its flowering habits, and producing more or less nectar and pollen every year. Although the individual trees blossom every second year there are some in flower every year, enabling the colonies

Fig. 8.—The Woolly Butt (Eucalyptus longifolia, Link).

of bees to breed up in autumn and lay in winter stores, even when no actual surplus honey can be obtained from hives. Bees usually gather great quantities of pollen from Grey Box, which often is the only available source at the end of the honey season.

The honey is of excellent flavour, medium density when fully ripe, amber in colour when free from other honeys, but candies rather quickly.

When heating Grey Box honey to reliquify it after it has granulated or at time of extracting, care should be taken that the temperature does not rise beyond 165° Fahr., otherwise it may darken considerably, particularly when in contact with iron.

Further, it should be noted that in contact with untinned iron such as occurs at the edges of the lever tops and the seams of honey tins, the

Fig. 9.—The White or Grey Box (Eucalyptus hemiphloia, F. von M.).

tannic acid of the honey will, in a moist atmosphere, react on the iron, causing an inky blackness which, when diffused throughout the contents of the tin, will considerably discolour the honey, sometimes giving it a dark-violet tinge. This discolouration will also occur when unripe Grey Box honey late in autumn is extracted from the combs in a badly tinned or rusty extractor.

When the honey is heated at time of extracting and drawn into brightly tinned packages and hermetically sealed, little or no discoloration will take place.

Some years ago it was assumed by a number of bee-keepers that under certain conditions Grey Box honey, as winter stores, was detrimental to the health and vitality of bees. Experiments made at the Government Apiary, however, do not support that assumption, as colonies put exclusively on both sealed and unsealed combs of Grey Box honey wintered splendidly. The decline or extinction of the stocks which originated this belief was probably the result of impaired vitality of the bees caused by a shortage of pollen during the rearing of the young bees previous to the flowering of the Grey Box.

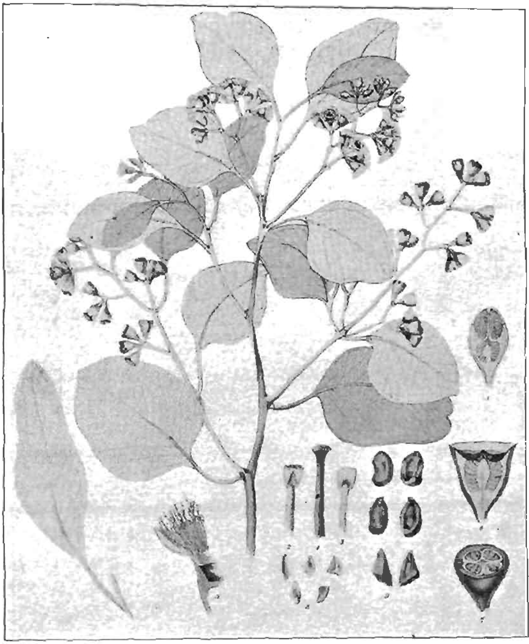
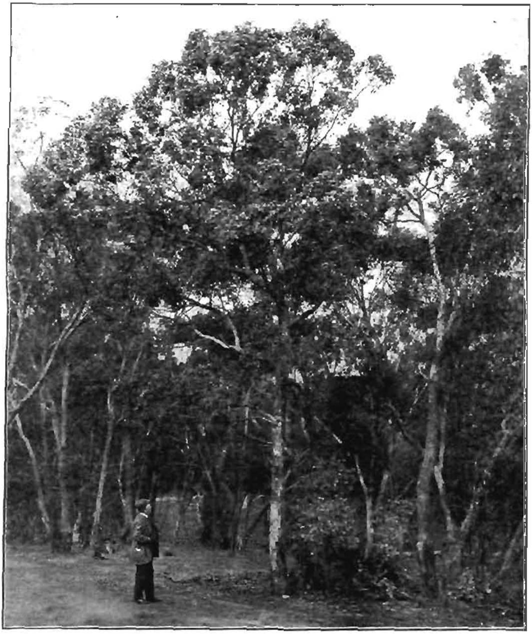


Fig. 10.—The Red Box (Eucalyptus polyanthema, Schauer).

WHITE BOX (*Eucalyptus hemiphloia albens.*)

This tree which in some localities is known as Blue Box owing to the distinctly bluish appearance of the foliage when seen from a distance, was at one time considered to be merely a variety of *Euc. hemiploia.* The bark of the White Box is, however, usually somewhat whiter than that of Grey Box, the leaves, flowers, and fruits are larger, and the tree grows as a rule on higher ground. The trunk has a tendency to



Red Box Trees (Eucalyptus polyanthema) in blossom.

become hollow at a comparatively early age. It flowers earlier in the season, and is freely worked on by the bees for nectar and pollen. As it precedes the Grey Box by about a month it is very valuable to the bee-keeper in providing a pollen supply to get the colonies into good working condition for the Grey Box bloom, as there is often a dearth of pollen just before.

To the best of the writer's knowledge this tree does not occur any where in very large numbers, and is, therefore, valuable more as a pollen yielder than a nectar secretor.

The Red Box (*Eucalyptus polyanthemos*).

Fig. 10.

The Red Box in some localities called Peppermint or Peppermint Box, or Lignum Vitae, is a tree of fair size, not often very straight in the trunk. It is generally found on rather poor land, on stoney or gravelly rises and ironstone ridges in districts with a comparatively small rainfall. The bark is generally dark-grey, persistent, rough and furrowed, and continues right up to the small branches. The leaves are broad, oval, or egg-shaped pointed, on rather long leaf stalks, the veins strongly marked, the marginal one removed from the edge, particularly so in the sucker leaves, the lateral veins oblique and distant. The flowers are generally on new growth, but also as laterals on the previous season's wood in umbels of 3—6 small flowers. The buds, which are roundish, appear from ten to twelve months before flowering, which occurs from September to November. It is fairly regular in flowering, some trees every year, a greater number every second year. The fruits are pear-shaped. The blossom does not yield pollen to bees in quantities worthy of consideration. The honey is one of the palest, but rather dull in appearance, very dense, and on this account very difficult to extract from the combs. It has generally, but not always, a somewhat oily or tallowy flavour, not noticed, however, by palates used to it. When quite free from other honey it does not candy. Blended with other honeys it gives body and reduces the colour. When kept for at least twelve months the oily taste almost disappears.

The timber of this tree is hard, red in colour, the grain interlocked. It is a durable wood used to some extent for railway sleepers, mining props, and firewood.

(*To be continued.*)

AGRICULTURAL SCIENCE.

Further excerpts from papers read before the Agricultural Section of the British Association for the Advancement of Science at the Australian meeting, August, 1914:—

MIGRATION OF RESERVE MATERIAL TO THE SEED IN BARLEY CONSIDERED AS A FACTOR OF PRODUCTIVITY.

By E. S. Beaven, Cambridge.

With barley the ratio of the dry matter accumulated in the seed to the total dry matter of the plant when fully ripe frequently influences the produce of grain to a greater extent than any other factor; also it is more important in barley than in either wheat or oats, because the value of the dry matter of the haulm (*i.e.*, the stem and leaves) is less with barley; also this ratio is higher in some races of barley than in any

variety of the other cereals, and probably higher than in any other cultivated plant. The paper deals with some of the bearings of these facts.

This ratio varies considerably as between different varieties of barley and as between races of the same variety of any cereal species. It has a high value for purposes of selection, especially in the early stages of selection from amongst a limited number of individual plants which are *the progeny obtained by the artificial cross-fertilisation of any two* individuals.

As between two races, each the progeny of a single plant of the F4 generation of the same cross, and with the same weight of dry matter in the entire plants on unit area, the inherited and persistent difference in the ratio referred to has been found in a series of experiments to be as much as 5 per cent. In consequence of this factor alone with the same *total weight of grain and straw on unit area the yield of grain was more* than 10 per cent. greater in some such races than in others.

In the case of hybrid races generally the number of individuals possessing different combinations of characters is very large, especially if minor characters affecting either productivity or quality are taken into account. The experimental error involved in selecting either individual plants, or aggregates which are the progeny of single self-fertilised plants, *for the purpose of starting new races of cereals is so great* in consequence of environmental conditions that no conclusions of *practical value can be drawn, except from a very large number of* observations, as to relative productivity when only the dry weight of the grain is taken into account, and then only if special methods of cultivation are adopted.

In the initiatory stages of new races it becomes, therefore, impracticable with any certainty to extract the most productive races from those originated by artificial crossing by the merely empirical methods hitherto *adopted.*

The paper describes the methods adopted in collaboration with Professor Biffen, and, in respect of the biometrical data obtained, with Mr. W. E. Gosset, and a summary of the conclusions arrived at from the experiments of the last five years; more particularly as to the value for selection purposes of accurate determination of the relative seed-forming energy as shown by the "coefficient of migration" of different *races of barley.*

WHEAT IMPROVEMENT IN AUSTRALIA.

By F. B. Guthrie, F.I.C., Chemist, Department of Agriculture, N.S.W., Lecturer in Technology, Sydney University.

Part I.

Early Inter-State action with regard to the study of wheat and its disease is reviewed, and it is shown how the original scheme developed.

The work of private individuals, working before State action was inaugurated, is discussed, and in particular the present position of the Farrer wheats is dealt with.

The special qualities looked for in wheats to be grown under Australian conditions are grouped under the following heads:—

(1) Resistance to rust and other diseases.
(2) Prolificness.
(3) Drought resistance.
(4) Milling quality.
(5) Wheats for hay.
(6) Wheats for different districts and climates.

It is shown how the interpretation placed on the above terms in Australia differs from that which obtains in other countries on account of the differing conditions; for example, wheats which resist rust locally succumb to this disease when grown in other parts of the world; some of the most prolific European varieties are very poor yielders when grown locally, &c.

The characteristics enumerated above are next considered more in detail.

(1) *Resistance to Rust, &c.*—The principal workers on this subject are referred to. The point is noted that the nature and life-history of rust are different in Australia. The question of rust-escaping by quick maturing is dealt with, and the damage done by rust in Australia, especially in the coastal districts, is discussed.

Remarks follow on some rust-resistant wheats.

(2) *Prolificness.*—The importance of this quality from a farmer's point of view. In the older wheats prolificness was very frequently associated with inferiority in other respects. The smallness of local yields is considered in comparison with other countries. The characteristics required in a prolific wheat are reviewed and some successful new varieties described.

(3) *Drought Resistance.*—It is shown that this property is of the greatest local importance in view of the extension of wheat-growing into drier areas. The characteristics to be looked for in dry country wheats are discussed, and some successful new varieties described.

(4) *Milling Qualities.*—The different requirements of English and Australian millers are referred to, and the characteristics of a good milling wheat for Australian conditions discussed. The export and internal trade are reviewed, and it is shown that there is a steady improvement in the quality of our locally grown wheat. Notes follow on some of our best milling wheats.

Part II.

The work done in the individual States in the improvement of wheat is reviewed under the following headings:—

(1) Work done by individual investigators.
(2) Work carried out at Institutions under Departmental control.
(3) Action taken by the different States in furtherance of the object of improving wheats.

BIRDS DESTRUCTIVE TO VEGETABLE CROPS.

English Skylarks (*Alauda arvensis*).

By C. French, Junior, Government Entomologist.

The English Skylark was first introduced into Australia by the Royal Zoological and Acclimatization Society of Victoria in 1863. In that year numbers were let loose in Melbourne; 80 more in 1867, 30 in 1870 and 1872, 100 in 1873-4, and some were let loose near Sydney about 1870.

During the last few months the English Skylark has been much in evidence, especially in the Carrum, Mentone, and Cheltenham districts. There, these birds have been causing considerable annoyance and loss to market gardeners and others by the manner in which they have been destroying the young seedlings and plants of cabbages, cauliflowers, turnips, and lettuces. Recently, I visited the garden of a well-known market gardener residing near Mentone, and was surprised to see numbers of these birds busily engaged among the vegetable seed beds. On examining these beds I found that row after row of seed and seedling vegetable plants, also young cabbage plants that had been planted out, had been eaten. I requested the owner to shoot a few of the birds for examination purposes. Three birds were shot, and on examination their crops were found to contain cabbage and turnip seeds, young cabbage and raddish leaves, gravel, but no insects whatever.

The owners of the garden informed me that numbers of the birds had been destroyed by means of poisoned wheat. I also examined the crop of several of these, and the result was the same in every instance. Their crops were full of vegetable seeds and vegetable matter, not a solitary insect being found in any of them. If food was scarce, I could understand these birds attacking vegetable crops, but at the present time insects are plentiful, this being an unusual season for them.

It is rather unfortunate that such a beautiful and interesting bird has developed a liking for vegetables. It shows how careful the authorities should be of introducing birds of other countries into Australia, even if they are insectivorous in their own land.

NOTE ON WHEAT EXHIBITED FOR COMPETITION, ROYAL AGRICULTURAL SHOW, 1914.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

In 1913 the Royal Agricultural Society of Victoria adopted, for the first time, a system of judging wheats entered for competition according to their milling qualities. The varieties of wheat exhibited were divided into four classes—High Strength White, High Strength Red, Low Strength Red or White, and Macaroni Wheats. These four classes comprise all the varieties commonly grown in the State, and the classification of wheats in this manner was intended to direct attention to the importance of milling quality in wheat.

This year a similar practice was followed, and while the entries are not quite as numerous as last year, it is gratifying to record that there was a very marked improvement in the quality of the exhibits.

Each sample submitted for competition was milled in the small experimental flour mill, and exact information was thus obtained regarding the milling and baking qualities of the sample.

As indicated above, there was a marked improvement in quality of all classes examined as compared with last year, and this may be seen by comparing the classes in regard to characters in which exact data are obtainable, *e.g.*, bushel weight, strength of flour, and gluten content of flour. This comparison is given in the following table:—

TABLE I.—COMPARISON OF WHEATS EXHIBITED IN FOUR CLASSES, 1913 AND 1914.

—	Year.	Bushel Weight.	Strength of Flour.	Gluten Content.
		lbs.	Quarts per Sack.	Percentage.
1. Average of High Strength White Exhibits	1913	67·9	53·4	7·6
" " " " " ..	1914	68·1	55·6	10·0
2. Average High Strength Red Exhibits ..	1913	67·3	50·3	9·7
" " " " " ..	1914	67·2	55·0	10·9
3. Average Macaroni Exhibits	1913	66·3	46·7	10·8
" " "	1914	66·1	49·4	11·9
4. Average Low Strength Wheat Exhibits ..	1913	66·6	44·1	8·0
" " " " " ..	1914	67·4	44·9	9·8
5. Average all Wheats Exhibited	1913	66·8	46·1	8·4
" " "	1914	67·6	49·9	10·3

It will be seen that a most marked improvement is shown in strength of flour and in gluten content of the flour, the average of this year's samples having a bushel weight of 67.6 lbs., as compared with 66.8 lbs., and the flour a strength of 49.9, as compared with 46.1, and a gluten content of 10.3 per cent., as against 8.4 per cent. last season.

HIGH STRENGTH WHITE CLASS.

The prize for High Strength White was won by exhibit No. 4179, with a fine sample of Comeback grown by William Tonkin, at Delungra, and weighing 67.8 lbs. per bushel. This was a bright, attractive sample of hard translucent grain, giving a high percentage of flour of exceptional strength (58 quarts per sack), and possessing a good gluten content. The points scored were 93. The second prize was awarded to entry No. 4176, also Comeback, weighing 67.4 lbs. per bushel, giving flour of high strength and gluten content. This sample was grown by W. H. Scholz, of Gilgandra.

The other entries, Nos. 4177 and 4178, were also Comebacks, and it is interesting to compare these two samples with entries Nos. 4179 and 4176. The latter are harder, more translucent, and of considerably higher strength and gluten content, the effect, most probably, of different soil and climatic conditions.

High Strength Red Class.

The prize was awarded to entry No. 4173, a magnificent sample of Cedar, grown by W. H. Scholz, of Gilgandra, weighing 68½ lbs. per bushel. This sample gave a high yield of flour of excellent quality, the strength being the same as the winning wheat in the High Strength White class. It is interesting to note that this sample was grown on heavy red soil, without manure, and yielded 35½ bushels per acre, the rainfall from seed to harvest being 9 inches.

Second prize was awarded to entry No. 4174, grown by William Tonkin, of Delungra.

Macaroni Class.

In this class the prize was awarded to entry No. 4172, with a bright, well-grown sample of Indian Runner, exhibited by W. Clark, of Angle Vale. The gluten content of the flour was the highest of all the exhibits (13.6 per cent.).

Low Strength Class.

Pride of place in this section was awarded to entry No. 4184, with an excellent sample of Bunyip. The sample was grown by W. Tonkin, at Delungra, on black soil, without manure, and yielded 25 bushels per acre, the rainfal from seed to harvest being 13½ inches.

The weight per bushel was 67.6, the wheat was easy to mill, and gave a flour of excellent colour, fair strength, and good gluten content.

Second prize was awarded to entry No. 4182, with a fine sample of King's Early, grown by J. B. Schulze, at Dimboola. The seed was sown at the rate of one bushel per acre with 60 lbs. super., and yielded 29 bushels per acre, the rainfall from seed to harvest being 7 inches.

The weight per bushel of this sample was exceptionally high (69.1 lbs.), the sample was plump and uniform, the flour of high strength for its class, and the loaf rose well in the oven.

Champion Prize.

The champion prize was awarded to entry No. 4179, with a sample of Comeback wheat—the winning variety in the High Strength White class.

The following table summarises the main features of the wheats exhibited. In determining the points for each wheat, the bushel weight, general appearance of grain, ease of milling, percentage of flour, colour of flour, strength of flour, and gluten content were taken into consideration. The figures in brackets alongside the points awarded for bushel weight, percentage of flour, strength of flour, and gluten content of flour represent the actual results obtained in the determination of these qualities:—

JUDGING OF SHOW WHEATS, 1914.

POINTS AWARDED.

—	Bushels Weight Lbs.	Appearance of Grain.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Strength of Flour.	Gluten Content.	Total.
Maximum Points	15	15	10	10	15	20	15	100
HIGH STRENGTH.—WHITE CLASS.								
Catalogue No. 4176.—"Comeback"	(67.4) 13½	14½	10	(73.9) 9	11	(58.0) 20	(12.2) 14	92
,, 4179—"Comeback"	(67.8) 14	14½	8	(74.9) 9½	14	(58.0) 20	(11.2) 13	93
,, 4177—"Comeback"	(68.6) 14½	13½	9	(72.6) 8	13	(54.0) 18	(8.7) 11	87
,, 4178—"Comeback" . ..	(68.7) 14½	13½	9	(71.5) 7½	14	(52.6) 17	(7.4) 10	85½
HIGH STRENGTH.—RED CLASS.								
Catalogue No. 4173—"Cedar"	(68.5) 14½	15	7	(76.1) 10	13	(58.0) 20	(9.7) 11½	91
,, 4174—"Cedar" .. .	(68.2) 14	14½	7	(75.5) 10	13	(51.4) 17	(10.9) 12½	88
,, 4175—"Cedar" .. .	(65.0) 11	12	7	(75.5) 10	10	(55.6) 19	(12.3) 14	83
MACARONI CLASS.								
Catalogue No 4172—"Indian Runner" ..	(65.7) 11½	12	6	(74.0) 9	10	(50.4) 16	(13.6) 16	79½
,, 4171—"Velvet Don" ..	(66.6) 12½	12	6	(72.5) 8	10	(48.4) 15½	(10.0) 12	76
LOW STRENGTH CLASS								
Catalogue No. 4180—"Warren"	(66.0) 12	13	10	(69.3) 6½	15	(44.4) 14½	(9.0) 11	81
,, 4181—"Yandilla King" ..	(66.3) 12½	13	10	(73.2) 8½	14	(45.0) 14	(10.2) 12	83
,, 4182—"King's Early" ..	(69.1) 15	14	10	(71.1) 7½	12	(47.2) 15	(7.8) 10	83½
,, 4183—"Bunyip"	(69.2) 15	14	10	(71.1) 7½	11	(43.6) 14	(8.9) 11	82½
,, 4184—"Bunyip"	(67.6) 13½	13	10	(71.0) 7½	15	(44.0) 14½	(9.8) 11½	85
,, 4185—"Bayah"	(68.3) 14½	12	10	(71.3) 7½	14	(42.0) 13½	(9.8) 11½	83
,, 4174A—"Turkey Red" .	(65.7) 11½	12½	8	(72.3) 8	10	(48.0) 16	(9.8) 14	83

CHAMPION PRIZE OF AUSTRALIA.

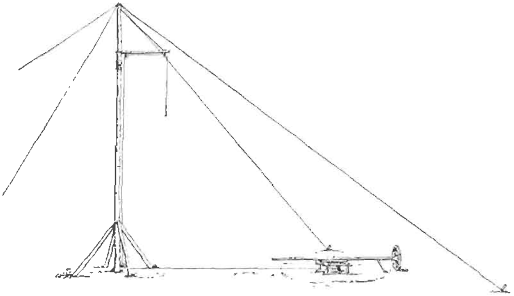
4179.—"Comeback."

B 2

LABOUR-SAVING APPLIANCES ON THE FARM.

By Temple A. J. Smith, Chief Field Officer.

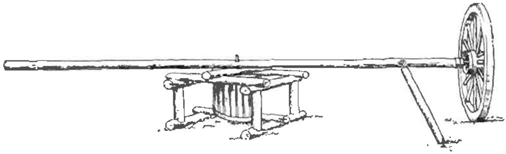
A device by which much time, money, and exertion may be saved in the making of silage, in the northern areas, where grass in the spring is abundant and fodder reserves are necessary, is to be seen on the farm of Mr. F. Rosau, Patho, who is to be complimented in more than one instance on his inventive skill. Much the heaviest work in making stack silage is involved in the lifting of the green-stuff on to the stack, and the system adopted by Mr. Rosau minimizes this labour very considerably.



Device for lifting green-stuff on to stack.

The whole appliance for raising the green-stuff is home-made, and can be set up by any handy man. The cost, apart from the time employed in making, is trifling, and the material necessary consists of wire, one coil No. 8 gauge; wire cable, 60 feet long, ½ inch diameter; about 500 feet of 3 inch by 2 inch battens; an old dray or buggy wheel axle; a secondhand dray wheel; two pulleys; two dozen ⅝-inch bolts, 8 inches long; and some bush timber in the shape of posts and saplings. Collar bands of iron for the top of the post, and each end of the drum should also be provided. Instead of the post, which should be 35 to 40 feet from the ground level, to insure sufficient height for a big stack, Mr. Rosau has utilized a tall tree, which he has cut off, allowing some of the branches to remain on the side away from the stack, and where they do not interfere with the working of the yardarm, &c. The tree, in

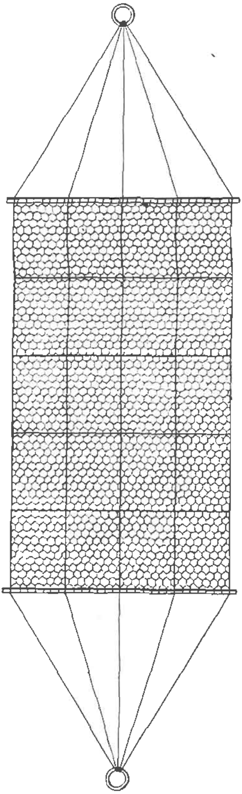
this way, preserves its life and adds to its utility. Failing the advantage of such a tree in the right position, a post 47 feet in length will be required, with a diameter at the top of not less than 6 or 8 inches. The butt should be put 7 feet into the ground, and be well rammed. Before the post is erected, the box of a buggy wheel should be let into the top of the post, and a collar band shrunk on to prevent its splitting. It is wise to prop the post on four sides to a height of 10 feet, but care must be taken not to extend the props to such a distance as might interfere with the location of the stack or load as it comes under the yardarm to be lifted. Slats can be nailed on to the post for use as steps, and a pole, in the shape of a mast, 12 feet long, placed on top of the post, into the butt of which has been inserted the axle corresponding with the box in the post, the shaft of the axle being let into the mast at least 18 inches, and well bound with wire or collar bands. This mast should be 8 inches in diameter at the butt, and be guyed from a ring of iron at the top, north, south, east, and west, with No. 8 fencing wire to posts secured in the ground. A yardarm, 9 feet in length and 6 inches in diameter, is mortised into the mast 2 ft. 6 in. from the butt, and bolted on at right



Drum for hoisting material for silage.

angles, the point of the yardarm being supported by a strong wire or chain from the top of the mast. A 6-inch pulley is suspended from the farther end of the yardarm, through which the wire cable is run, as shown in the diagram, with a hook on the end below the yardarm. The other end of the cable is taken through a 6-inch pulley firmly anchored to a sleeper in the ground, and to the drum which winds the cable up when lifting the load. The drum should be vertical, 3 feet in diameter, 2 feet in length, and made of 3 inch by 2 inch sawn hardwood on a spindle of 1½ inch diameter. A strong frame of box or redgum logs 4 feet square should be made to hold the drum in a vertical position, the top and bottom ends of the spindle being inserted in logs or hardwood planks bolted on across the upper and lower ends of the frame, which must be firmly fixed to sleepers in the ground. The upper end of the spindle should project 6 inches above the frame, and a pole is let on to this spindle working loose. When the drum is required to wind the wire cable, a strong iron hook attached to the side on the top of the drum is hooked into a ring bolt on the pole, the object of this system being to allow the drum to reverse when unwinding the cable in lowering the load on to the stack. A ratchet clutch fastened to the frame, and

working on the drum, prevents the latter reversing when the strain is taken off. The hook is then released from the pole, and the load of green-stuff swung round by the rope hanging from the yardarm into



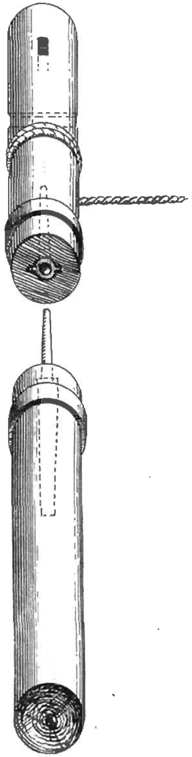
Tray for lifting load off waggon.

position on the stack, when the clutch is released and the load deposited where it can be spread as desired. It is a good plan to support the pole at the draught end by attaching an old wheel, and a trailing prop fixed

to and following behind the pole will take the strain off the horses' shoulders, when it is found necessary to stop hauling while the load is in the air. The power required to wind up the load is easily supplied with one horse, and a very much higher stack can be put up in this way than by hand. The advantage of a high stack is obvious, as the pressure over the greater depth excludes the air in greater degree, thus preventing waste, and insuring greater success in making the silage.

This system of making stack silage applies chiefly to grass, thistles, and wild oats and other rubbish suitable, but is not advised for maize, as the latter should be chaffed to obtain best results. The building of stack silage is not recommended generally, but when the practice is adopted, a contrivance such as is here described will be found to save time and labour.

Mr. Rosan estimates that he can make silage at a cost of about 1s. 6d. per ton, and he certainly has succeeded in making a good sample. He weights his stack with posts, which are also lifted by the same process as the green material.



Windlass for pulling down trees, erecting shed posts, &c. To be sunk in ground at an angle of 45 degrees.

Another ingenious appliance for elevating heavy posts was used on the same farm in the form of a windlass, made as follows:—A solid box log, 4 feet long, 9 inches in diameter, with a buggy axle let into the centre of one end; is sunk in the ground at an angle of 45 degrees. On this axle is placed another log 2 ft. 6 in. long, 9 inches in diameter, into which a buggy wheel box has been let in one end, and square holes, mortised at right angles both ways, with at least a space of 8 inches between. A wire cable is fastened to the upper log, and also to the object desired to be raised, when, with the aid of crowbars or handspikes, the upper log is revolved, and the cable so wound up. This machine is also home-made, and can be used for pulling down trees, pulling a leaning shed into an upright position, and other purposes.

BORAX A PREVENTIVE.

Department of Agriculture Discovers Method for Keeping Flies from Breeding.

As a result of experiments, the specialists of the United States Department of Agriculture have discovered that a small amount of ordinary borax sprinkled daily on manure will effectively prevent the breeding of the typhoid or house fly. Similarly, the same substance applied to garbage, refuse, open toilets, damp floors, and crevices in stables, cellars, or markets will prevent fly eggs from hatching. Borax will not kill the adult fly, nor prevent it from laying eggs, but its thorough use will prevent any further breeding.

The investigation, which included experiments with many substances, was undertaken to discover some means of preventing the breeding of flies in horse manure without lessening the value of this manure as a fertilizer for use by the farmer. It was felt that if some means of preventing the breeding of flies near a human habitation could be devised the disease spread by these filthy germ carriers could be greatly reduced. While the "swat the fly campaign," traps, and other devices for reducing the number of typhoid carrying flies are of value, they are of less importance than the prevention of the breeding. It was realized, however, that no measure for preventing the breeding of flies would come into common use unless it was such that the farmer could use it on his manure pile without destroying its usefulness for growing plants, and without introducing into the soil any substance that would interfere with his crops.

As a result of experiments carried on at the Arlington farm, in Virginia, and New Orleans, La., the investigators found that 0.62 of a pound of borax, or 0.75 of a pound of calcined colemanite (crude calcium borate) would kill the maggots and prevent practically all of the flies ordinarily breeding in eight bushels of horse manure from developing. This was proved by placing manure in cages and comparing the results from piles treated with borax and from untreated piles. The borax, it was found, killed the fly eggs and maggots in the manure and prevented their growth into flies.

In the cases of garbage cans or refuse piles, two ounces of borax or calcined colemanite, costing from 5 cents a pound upward, according to the quantity which is purchased, will effectually prevent flies from breeding.

While it can be safely stated that no injurious action has followed the application of manure treated with borax at the rate of .62 pounds for eight bushels or even larger amounts in the case of some plants, nevertheless borax treated manure has not been studied in connexion with the growth of all crops, nor has its cumulative effect been determined. It is, therefore, recommended that not more than fifteen tons of the borax treated manure should be applied per acre to the field. As truck growers use considerably more than this amount, it is suggested that all cars containing borax treated manure be so marked, and that public health officials stipulate in their directions for this treatment that not over .62 of a pound for eight bushels of manure be used, as it

It is also recommended that all public health officials and others in recommending borax treatment for killing fly eggs and maggots in manure, warn the public against the injurious effects of large amounts of borax on the growth of plants. Purchasers of manure produced in cities during the fly breeding season should insist that the dealers from whom they purchase give them a certified statement as to whether or not the manure in the particular car or lot involved in the purchase has been treated with borax.

In feeding to hogs garbage that contains borax care is also recommended, especially when the animals are being fattened for market. Borax is not a very poisonous substance, and the feeding of garbage that contains it to hogs is not likely to be a serious matter. On the other hand, borax in large quantities does produce gastric disturbances, and for this reason a certain amount of care is advisable.

The method for using this substance in the case of stables is to sprinkle the borax or colemanite in the quantities given above by means of a flour sifter or other fine sieve around the outer edges of the pile of horse manure. The manure should then be sprinkled immediately with two or three gallons of water to eight bushels of manure. It is essential, however, to sprinkle a little of the borax on the manure as it is added daily to the pile, instead of waiting until a full pile is obtained, because this will prevent the eggs which the flies lay on fresh manure from hatching. As the fly maggots congregate at the outer edge of the manure pile, most of the borax should be sprinkled there.

Borax costs 5 to 6 cents (2½d. to 3d.) per pound in 100-pound lots in Washington, and it is estimated that at this rate it would cost only 1 cent (½d.) per horse per day to prevent all breeding of flies in city stables. If calcined colemanite is purchased in large shipments, this cost should be considerably less. At the same time, if the borax is used on the manure only in the proportions stated, its value for use in the garden or for sale to farmers will not be lessened.

In view of this discovery, there now seems little excuse for any horse owner or resident of a city allowing typhoid flies to breed in his stable or garbage can.

The details of the experiments with borax and other larvacides will be found in United States Department of Agriculture bulletin No. 118. —*Chicago Dairy Produce*, 25th July, 1914.

STANDARD TEST COWS.

REPORT FOR QUARTER ENDING 30th SEPTEMBER, 1914.

In this, the first quarterly report of the new season, fifty-eight cows are eligible for inclusion. This number has qualified from a total of sixty-eight which completed their terms during the quarter.

During the period two new herds entered the test—both Jersey. These are owned by Mr. A. Box, of Hiawatha, South Gippsland, and Mrs. Agnes Black, of Noorat, respectively. In considering the yields published below, it is only fair to bear in mind that the weather conditions which existed during the period which they cover could not be calculated to favour the cows. The deficient rainfall, which characterizes the present year, must necessarily have militated against the milk yield; but as, in the quarter under review (admittedly too short a period over which to make a perfectly fair comparison) there is not only no general diminution of flow, but, in many cases, an improvement, some counteracting factor must have been operating. As the food supply has certainly been receiving more attention from the various owners, there seems to be little doubt that the factor responsible is the better feeding. For this, as regards our dairy herds generally, the Department of Agriculture has long contended there was room.

As indicating the all-round excellence of the herds undergoing the Government tests, attention may be properly directed to the exceptionally high average tests recorded. Of the fifty-eight cows certificated for the quarter, one tested over 7 per cent. butter fat throughout the milking period; ten (or 17½ per cent.) tested over 6 per cent. butter fat; thirty-eight (or 65.5 per cent.) tested over 5 per cent. butter fat; fifty-five (or 95 per cent.) tested over 4 per cent. butter fat; and the remaining three cows tested over 3.8 per cent.

Furthermore, it is pleasing to be able to intimate that the efforts of the herd masters concerned, whereby such excellent herds have been established, are being rewarded. Reports to hand show that dairymen are keenly appreciative of the guide afforded by the Government test in the purchase of young bulls, the demand for which, from the herds undergoing the test, is lively. At the recent Melbourne Royal Show sales the preference shown by buyers for the progeny of certificated cows was very marked, while the contemplated action of the Royal Agricultural Society, at the instance of Mr. Oswald J. Syme, of providing classes confined to certificated cows is significant of the desire that merit in the commercial sense shall in future be given greater prominence than fancy show points only.

Individual returns are as follow:—

DEPARTMENT OF AGRICULTURE, Werribee. (RED POLL.)

Completed—5. Certificated—5.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gold Leaf ..	Not yet allotted	30.9.13	7.10.13	273	10	6,895	4·49	309·50	200	352¾
Egypta	„	7.10.13	14.10.13	273	17	6,682*	4·13	275·80	250	314¼
Kentucky ..	„	22.10.13	29.10.13	273	20	7,804½	3·96	309·02	250	352¼
Ardath	„	8.12.13	15.12.13	273	10½	5,640	4·80	270·64	200	308¼
Tuckahoe	„	11.12.13	18.12.13	273	15½	3,986½	4·75	189·41	175	216

* Sickness for seven days affected yield.

F. CURNICK, Malvern. (JERSEY.)

Completed—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Peerless Pearl ..	Not yet allotted	1.10.13	8.10.13	273	15	6,000	5·34	320·71	175	365½

GEELONG HARBOUR TRUST, Marshalltown. (AYRSHIRE.)

Completed—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Sylvia of Glen Elgin	1845	5.10.13	12.10.13	273	12½	8,273¼	3·84	318·00	250	362½
Daphne of Sparrovale	Not yet allotted	3.11.13	10.11.13	273	7½	4,909½	5·09	249·71	200	284¾

A. W. JONES, Whittington. (JERSEY.)

Completed—4. Certificated—4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Pet	Not yet allotted	16.10.13	23.10.13	219*	14¾	4,171¾	5·45	227.61	200	259¼
Lady Marge III. ..	„	18.10.13	25.10.13	269†	13	5,107½	6·42	333.66	200	380¼
Dolly	„	18.10.13	25.10.13	221‡	16½	3,650¾	6·30	230.07	175	262¼
Blanchette III. ..	„	21.10.13	28.10.13	273	11½	5,373¼	5·50	295.59	200	337

* Lost 54 days at commencement of test.
† Lost four days at commencement of test.
‡ Lost 52 days at commencement of test.

C. G. KNIGHT, Cobram. (JERSEY.)

Completed—3. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Tarnpirr	2986	29.11.13	6·12.13	273	11½	5,674	5·07	287.98	175	328¼
Gem of Tarnpirr ..	2004	17.12.13	24.12.13	269*	13	3,681½	5·65	208.08	175	237¼
Romany Lass ..	*2563*	*25.12.13*	*1.1.14*	*273*	*16*	4,283¾	5·62	240.82	175	274½

* Sold four days before expiration of term.

C. D. LLOYD, Caulfield. (JERSEY.)

Completed—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Queen Spark ..	2533	12.11.13	19.11.13	237*	15½	4,194¼	7·04	295.24	200	336½
Countess Twylish ..	928	15.11.13	22.11.13	273	22	8,505½	5·11	435·13	250	496

* Lost 36 days, as weights not available.

C. GORDON-LYON, Heidelberg. (JERSEY.)

Completed—3. Certificated—3.

Name of Cow	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Kathleen II. ..	1104	17.10.13	24.10.13	273	15	7,155¼	4·43	317·11	250	361¼
Lassie II.	1136	29.11.13	6.12.13	273	28½	9,385¼	4·79	450·45	250	513¼
Fox's Lassie of Banyule	1026	*30.11.13*	7.12.13	273	21	6,673¾	4·95	330·78	200	377

W. McGARVIE, Pomborneit. (JERSEY.)

Completed—4. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy	Not yet allotted	26.9.13	3.10.13	273	14	4,608¾	4·29	197·67	175	225¼
Bessie	1584	27.9.13	4.10.13	273	17¾	6,128¾	4·43	271·39	200	309½
Stockings	Not yet allotted	10.10.13	17.10.13	273	10	4,316¾	4·61	199·21	175	227

W. T. MANIFOLD, Camperdown. (SHORTHORN.)

Completed—2. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Sunflower ..	Not yet allotted	25.9.13	2.10.13	268½*	12¼	8,671½	4·09	354.98	250	404¾

* Lost four and a half days. Last weights not available.

J. D. READ, Springhurst. (JERSEY.)

Completed—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Grannie of Springhurst	2059	5.10.13	12.10.13	259	5¼	5,612¼*	6·11	342·81	250	390¾

* An attack of mammitis affected yield.

Miss S. L. ROBINSON, Burke-road, Malvern. (JERSEY.)

Completed—2. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lotina (imp.) ..	1160	26.10.13	2.11.13	273	15	8,200	5·20	426·63	250	486¼
White Belle (imp.) ..	1488	2.11.13	9.11.13	273	22¼	9,044	5·09	460·73	250	525¼

W. P. BRISBANE, Weerite. (AYRSHIRE.)

Completed—9. Certificated—6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Jean of Gowrie Park	2425	26.9.13	3.10.13	273	21	5,418½	4·75	257·50	175	293½
Trilby of Gowrie Park	2124	28.9.13	5.10.13	273	16½	5,130¾	4·23	216·86	200	247¼
Laura IV. of Gowrie Park	1709	5.10.13	12.10.13	273	10½	9,291½	4·67	434·13	250	495
Songstress of Gowrie Park	2122	8.10.13	15.10.13	273	18½	5,988½	4·33	259·26	250	295½
Tulip of Gowrie Park	2435	10.10.13	17.10.13	273	27½	6,588½	4·47	294·26	175	335½
Apple Pie of Gowrie Park	2409	1.11.13	8.11.13	273	13½	4,832¾	3·98	192·16	175	219

F. J. STANSMORE, Pomborneit. (AYRSHIRE.)

Completed—6. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gladness	Not yet allotted	16.10.13	23.10.13	214	7	6,065¾	4·62	280·58	250	319¾

J. J. TOMLIN, Lyndhurst. (AYRSHIRE and JERSEY.)

Completed—4. Certificated—0.

W. WOODMASON, Malvern. (JERSEY.)

Completed—24. Certificated—24.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	Days in Test.	Weight last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Laura VII. ..	Not yet allotted	25.9.13	2.10.13	273	22	8,101½	5·33	432·16	250	492¾
Carrie V. of Melrose	..	8.9.13	6.10.13*	273	17	6,109	6·92	422·84	250	482
Waverley Lass ..	2793	30.9.13	7.10.13	273	26	7,588¾	5·31	402·74	250	459
Chevy VII. ..	Not yet allotted	2.10.13	9.10.13	273	12½	4,816¾	5·97	287·63	175	328
Daisy of Melrose ..	..	2.10.13	9.10.13	273	13	4,060	5·47	219·33	175	250
Jenny Lind VIII. ..	..	2.10.13	9.10.13	273	15	5,639	5·78	326·08	175	371¾
Peerless VII. ..	..	3.10.13	10.10.13	273	12½	4,683½	6·13	287·37	175	327½
Flower of Melrose V.	..	7.10.13	14.10.13	273	20	7,678	5·76	442·32	250	504¼
Jessie VIII. of Melrose	..	16.10.13	23.10.13	273	15½	6,554½	6·27	410·90	250	468½
Fuchsia VIII. of Melrose	..	17.10.13	24.10.13	273	12	4,261¾	6·29	268·23	175	305¾
Pearl II. of Melrose ..	..	17.10.13	24.10.13	273	11½	3,924½	5·60	219·75	175	250½
Lily IV. of Melrose ..	..	18.10.13	25.10.13	273	13¼	5,026¾	5·83	293·20	175	334¼
Peerless III. of Melrose	2817	20.10.13	27.10.13	249	4½	6,318¼	5·48	346·31	250	394¾
Graceful Duchess X. of Melrose	Not yet allotted	20.10.13	27.10.13	273	10	4,230½	6·68	282·85	175	322½
Quality VI. of Melrose	..	23.10.13	30.10.13	273	22	7,158½	5·83	417·45	250	476
Handsome Girl VI. of Melrose	..	26.10.13	2.11.13	273	12	4,234	6·63	280·56	175	319¾
Bessie VI. of Melrose	..	1.11.13	8.11.13	273	17	5,832½	5·08	296·23	200	337¾
Rarity VI. ..	..	4.11.13	11.11.13	273	13½	6,420	5·88	377·47	200	430¼
Mystery XII. ..	..	12.11.13	19.11.13	273	14	4,664¾	5·77	268·97	200	306¾
Jessie IX. of Melrose	..	22.11.13	29.11.13	273	21	6,785¾	5·59	379·75	250	433
Flower VI. of Melrose	..	23.11.13	30.11.13	273	19	6,002¼	5·77	346·18	250	394¾
Banker VI. of Melrose	..	24.11.13	1.12.13	264†	20½	5,743½	5·08	291·90	175	322¾
Mermaid II. of Melrose	..	13.12.13	20.12.13	242½‡	19	4,930¼	5·53	272·83	200	311
Lassie Fowler III. of Melrose	1137	22.12.13	29.12.13	273	22	7,287¼	5·83	425·00	250	484½

* Entry deferred three weeks, as no weights available.
† Lost nine days, as weights not furnished.
‡ Lost 30½ days, as weights not furnished.

E. KEAM, Heidelberg. (JERSEY.)

Completed—1. Certificated—0.

THE WALNUT.

(Continued from page 688.)

By C. F. Cole, Orchard Supervisor.

Selection.

When planting young walnuts, whether seedlings or worked trees, only those of a strong, vigorous, and healthy nature should be selected. Any trees that are stunted, or show a weakly tendency should be discarded. Too much importance cannot be placed upon selecting the right type of young tree. Apart from the planter wishing to have trees of uniform growth, the young walnut tree should be planted with the sole object of making seasonable, healthy growth, reaching a great age, becoming and remaining productive over a lengthy period. Plate 11 shows a good healthy type of a seedling English walnut twelve months old having a free, clean, and unchecked terminal growth. Trees in the nursery row that have received a severe check through unfavorable conditions brought about by excessive soil moisture, &c., will probably, when planted out permanently under good conditions, make favorable growth for some years, but sooner or later the result of early weakness will become apparent, and many years will be lost by planting such trees.

Treatment.

Seedling English walnuts during the early period of their growth usually have a large taproot thicker than the stem above ground (see Plate 11). This tap root, being soft, is very susceptible to decay, either through injury or excessive soil moisture. If caused by the latter, decay generally sets in at the extreme end of the root, working upwards. If through injury, decay from the injured part will ultimately penetrate into the pith or medulla and work upwards, causing death or debilitation. Any tree whose tap root has been injured upon the upper or large portion when being lifted from the nursery row or in any other manner, should be discarded. Plate 12 shows a healthy section of a tap root from an English walnut seedling. This tap root during its very early growth is as easily cut as a carrot. In the centre of the section will be seen the pith or medulla, looking at this stage somewhat like that part of a carrot commonly termed the heart. Plate 13 shows a decayed section of tap root, the light portion in the centre showing the pith missing owing to decay. One of the surest indications of tap root trouble is the dying back of the growths, beginning generally at the terminal ends, causing general debility of the whole tree. If "die back" should make its appearance, and the planter is certain that it is not caused by bacterial or other disease, the tree or trees should be removed and replaced by strong, healthy ones. Immediately upon removal the tap and lateral roots should be carefully examined to make certain that the cause is attributable to root decay brought about through early injury or excessive soil moisture. If through the latter, drainage must receive attention before re-planting. If trees after being planted for a couple of seasons make poor growth, and have a stunted appearance, a good plan is to reduce

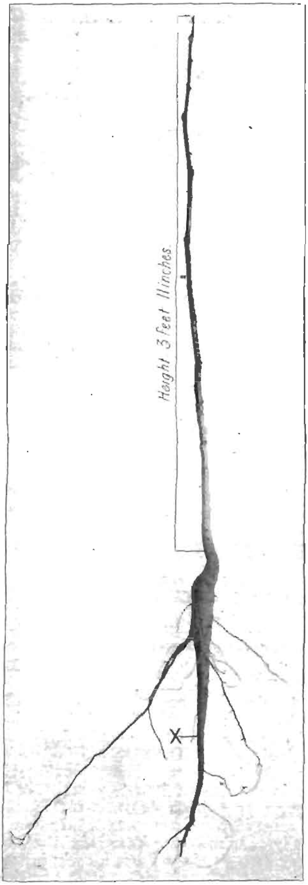


Plate 11.—Suitable type of young English Walnut tree for planting.
X indicates where to cut tap root.

them back close to the ground level. Trees thus treated often send up a shoot low down, make rapid growth, and become thrifty. If they continue to show signs of weakness they should be replaced by strong, healthy trees.

There is much diversity of opinion amongst growers regarding the cutting of the tap root before planting. Some state that the trees are longer lived and not so likely to die out if the tap root is cut, and that as soon as the tap root (if not cut) penetrates to a certain depth root decay sets in. Others again, uphold the theory that it is necessary for the tap root to penetrate the soil to a depth so as to reach the water table if the walnut is to be grown successfully. The cutting of the tap root has decidedly a more beneficial than an injurious effect upon the future of the tree if properly performed, and at the right time. It is of greater advantage to have a tree with a wide-spreading root system than one with a straight tap root. The idea of leaving the

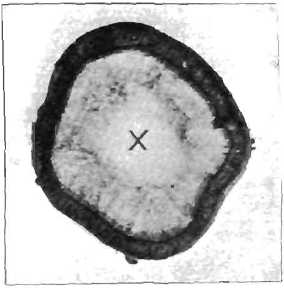


Plate 12.—Healthy section of tap root, English Walnut. X indicates pith or medulla.

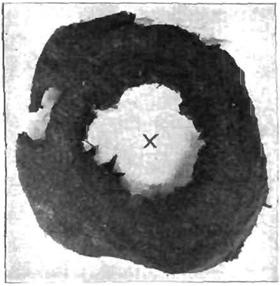


Plate 13.—Decayed section of tap root, English Walnut. X indicates missing pith or medulla through decay.

tap root uncut to enable the tree to reach the water level is not borne out in practice, for, as already stated, the finest examples of trees growing in the State are found upon high ground, and out of reach of any water table. Under perfect climatic and soil conditions probably the advantage to be gained by cutting the tap root of the English walnut is to encourage a lateral root system. The virtues of such a root system are that the trees will more readily receive the benefit of any fertilizers that may be applied to the soil, and are less liable to root decay through excessive soil moisture that may exist deep down in the subsoil.

When cutting the tap root of a tree planted from the nursery row, only a small portion should be cut away at the thin or terminal end of the root (see Plates 11 and 14). The cut should be made clean and straight across, a sharp knife being used for the purpose. It should be borne in mind that a tree having its tap root cut when planting is more

susceptible to root decay for the first twelve months after planting, than is a tree with a healthy uncut tap root. The reason is that excessive moisture, particularly when the wound is fresh, will interfere with the *granulated tissue (callus) that forms to heal the wound. If such*

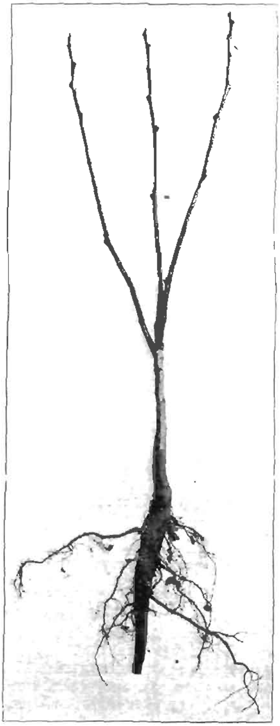


Plate 14.—Walnut tree carrying growths too low down.

conditions should come about the pith will decay and cause death or debility to the tree.

Between the time the trees are lifted from the nursery row and planting out permanently the roots should not be allowed to become dry.

If there is any delay in planting, the young trees should be heeled in the ground until required, the soil being placed well about the roots. Before planting the roots should be carefully examined, and any bruised parts cut away with a sharp knife.

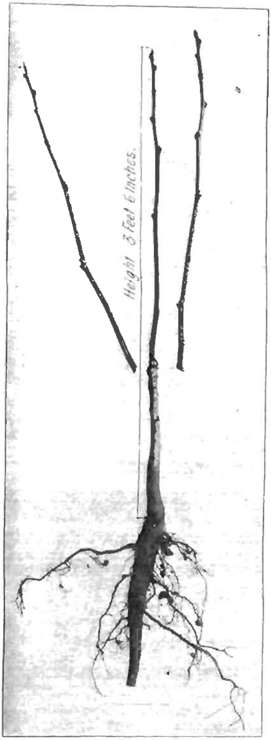


Plate 15.—Correct treatment cut away side growths.

Usually when planting the seedling English walnut very little, if any, pruning is necessary. The seedlings usually make one straight, vertical growth for the first few seasons, when they start to branch.

If trees over 6 feet in height are being planted, they should be headed back to within 5 or 6 feet from the ground level, these heights being the most suitable for starting and establishing the head. If, when planting, the trees should contain any side growths, as shown in Plate 14, below 5 to 6 feet from the ground level, the side growths should be cut away, and only one straight, vertical growth left (see Plate 15). When this growth reaches the height of 5 or 6 feet it should be checked or headed back the following winter to force out terminal side growths to form a head. Some American authorities recommend when planting out the walnut, to reduce the young trees back to within 18 inches of the ground level. The result of this cutting is that a shoot will be sent up to form a new trunk that in almost every instance will produce a top superior to that of trees left uncut, or cut back to a height of from 5 to 6 feet. This advice is sound. Hard cutting back when planting out deciduous fruiting trees is highly beneficial, the balancing of the top with the root being conducive to starting fresh vigorous growth, which usually far exceeds the growth of trees that have been lightly cut, or not cut at all when planted out. Generally speaking, one to two year old English seedling walnuts are the most suitable for transplanting from the nursery row, although much older trees can be shifted with safety. The trunk of such young trees, composed as they are of new and fresh vigorous tissue, usually make good headway from the start, and do not require hard cutting back. With stunted trees, or those with the trunk composed of hardened tissue, causing the sap flow to become sluggish, it is advisable to reduce back to a sound healthy bud 18 inches from the ground level to form a new trunk. After cutting, the wound should be carefully covered with grafting wax. The formula for making the wax will be given when dealing with propagation methods.

(To be continued.)

STATE FORESTS OF GERMANY.

According to Government returns, the State forests of Germany cover 10,607,336 acres, and bring in £6,084,129 in revenue. This is only 11s. 6d. an acre, but it is estimated that if the land where the forests are situated were used for agricultural purposes the revenue would be probably far less, and possibly not more than 5s. per acre.

Population must increase rapidly, more rapidly than in former times; and ere long the most valuable of all arts will be the art of devising a comfortable subsistence from the smallest area of soil.—Abraham Lincoln.

According to experiments conducted at the Harper-Adams Agricultural College, England, both lime and gas lime applied up to 10 tons per acre were found to be effective in suppressing sorrel. There appeared to be no additional advantage in a heavier application than the 10 tons. There is every evidence, says the report, that systematic liming is the best means of dealing with sorrel.—*Journal of the British Board of Agriculture.*

FRUIT PROSPECTS.

By P. J. Carmody, Chief Orchard Supervisor.

The fruit prospects for the coming season are the worst experienced throughout the State for many years. The thrip has been responsible for very extensive damage in most districts. The apparent spontaneous appearance of these insects makes it impossible to prevent serious losses by growers. A heavy frost on the night of the 15th October, just at a critical time of setting of many kinds of fruit, caused heavy dropping. The dry condition of the past year, whereby the fruit buds were only partially developed, was another important factor in the non-setting of fruit.

As will be seen from the subjoined reports from the various districts by the Orchard Supervisors, normal crops can only be expected from Somerville and Bairnsdale.

Mr. H. W. Davey, Orchard Supervisor:—The fruit prospects at Bacchus Marsh are very poor; thrips and frosts have practically destroyed the whole crop.

Prospects of fruit crop, season 1914-15, in the Diamond Creek district. E. Wallis, Orchard Supervisor—

Throughout the whole of the above district, comprising Arthur's Creek, Diamond Creek, Kangaroo Ground, Panton Hill, Queenstown, Research, Whittlesea, and places near same, the fruit crop, owing to the droughty conditions obtaining for so many months, the attacks of thrip and the severe frost experienced on 16th October, has been so reduced that a very small proportion of the average crop will be harvested.

Apple.—Rome Beauty blooms opened freely and are setting well. There should be a good crop of this variety. Other late bloomers, such as Five Crown and Hoover, also promise fairly well; but all other varieties will be very light.

Cherry.—Light average crop.

Peach.—Peaches on the whole set well. As this fruit is generally grown on the flats it has suffered much from frost. The average crop will be very light.

Pear.—Most varieties failed to set owing to the drought and thrip. Williams' Bon Chretien, however, has set very well, and, where grown on hills, thus escaping the effects of frost, the crop of this variety will be heavy. Beurre Bosc and Broom Park also set well.

Plum.—Very light average crop.

Prospects of fruit crops, season 1914-15, in the Doncaster district. A. A. Hammond, Orchard Supervisor—

Apples.—Very light. There are practically no Yates. Jonathans are very light, there being less than 5 per cent. of a normal crop. Five Crowns are also light. Rome Beauty light to medium. A few early sorts, notably Gladstone and Duchess de Oldenberg, have set a fair crop.

Apricots.—Light to medium. Not largely grown.

Peaches.—Light to medium. In some orchards there is a heavy crop of early peaches, but the prospects vary considerably in different orchards. In low-lying orchards the crop was ruined by a late frost.

Pears.—Light to medium. Two varieties only have a good crop throughout the district, namely, Williams' Bon Chretien and Beurre Bosc. Howells are also fair in many orchards. Other leading varieties, including Keiffer's, Winter, Nelis, Winter Cole, and Beurre de Capiaumont, are practically barren this year. The Beurre de Capiaumont has a light crop in a few orchards.

Plums.—Light to very light. The Angelina is the only variety that has anything like a normal crop.

Cherries.—Light. The Bedford and the Twyford varieties have set a fair crop in most of the orchards. The late cherries are mostly a failure. The Early Purple Guigne is patchy.

Lemons.—Medium to good. The lemon crop is normal. In some plantations there is a heavy crop.

Strawberries.—Medium. Strawberries are setting well, despite the thrip. There is a rather large percentage of deformed berries, due to the thrip. The crop promises to be about normal.

Quinces.—Light to medium. The frost did considerable damage to the quince crop, as the trees are mostly in low situations.

Gooseberries.—Very light.

Loganberries.—Very light. Due chiefly to the late frost.

REMARKS.—The prospects in the early spring were excellent for all kinds of fruit. Owing, however, to an early visitation of thrip and a late frost, only 20 to 30 per cent. of a normal crop will be harvested, as far as can be judged at time of writing.

Prospects of fruit crops, season 1914-15, in the Evelyn district. J. Farrell, Orchard Supervisor—

BAYSWATER.

Apples: All varieties light. Pears: Williams' Bon Chretien, medium; all others, light. Plums: Medium to light. Peaches: Light. Apricots: Light. Strawberries: First crop, light.

BLACKBURN.

Apples: Light. Pears. Williams' Bon Chretien, medium; others, light. Peaches: Light. Apricots: Light. Plums: Light. Cherries: Light.

BRIGHTON.

Apples: Light. Pears. Williams' Bon Chretien, medium; others, light. Figs: A nice crop.

BURWOOD.

Apples: Light. Pears: Williams' Bon Chretien, medium to light; others, very light. Peaches: Light. Plums: Medium to light.

CROYDON.

Apples: Medium to light. Pears: Williams' Bon Chretien, medium; others, light. Peaches and apricots: Light. Plums: Light. Cherries: Light.

EMERALD.

Apples: Light. Pears: Very light; also plums. Strawberries. Light.

FERNTREE GULLY.

Apples, Pears, Peaches, Plums, and Strawberries: Medium to light.

RINGWOOD.

Apples, Pears, Plums, Peaches, Apricots: Light to very light. Strawberries medium.

VERMONT.

Apples, Pears, Plums, Peaches, and Apricots: Medium to light. Strawberries: medium.

WANDIN AND SEVILLE.

Apples: Mostly light. Pears: Williams' Bon Chretien and Beurre Bosc, medium; others, light. Plums: Japanese varieties, medium; others, light. Oranges and Lemons: Fair crop. Quinces: Medium. Loquats: Fair crop. Walnuts and Almonds: Medium. Figs: Fair crop. Gooseberries and Currants: Light. Passion Fruit: First crop, medium. Blackberries and Raspberries: Canes look well for a crop, but, owing to the presence of thrip, will probably be only medium. Strawberries: Plants look well, but blooms rather weak, crop medium.

WAVERLY.

Apples, Pears, and Plums: Medium to light. Peaches and Apricots: Light. Lemons and Oranges: Fair crop.

Prospects of fruit crops, season 1914-15, in the Gippsland district. S. Pilloud, Orchard Supervisor—

The apple crop is very light at orchards inspected at Beaconsfield, Officer, Pakenham, Garfield, Bunyip, Drouin, Warragul, Yarragon, Morwell, Traralgon, Cowwarr, Briagolong, Stratford, Bairnsdale, and Bruthen, due to the effect of a severe frost on the 19th inst., the dryness of the season, and the appearance of thrip. The export apple yield will be very small, and there must be a heavy decrease in the quantity gathered. As for Rome Beauty, Five Crowns and Rymer, it is very hard to say how these will yield, the bloom not having fallen yet.

It is apparent that the pear crop will be also light, with the exception of Williams, which should yield a very fair crop.

Apricots and cherries are very light.

Plums, a very fair crop. Peaches are good at Drouin, Warragul, Bairnsdale, and Bruthen.

Prospects of fruit crops, season 1914-15, in the Goulburn Valley district. *G. M. Fletcher, Orchard Supervisor*—

Apricots.—Generally speaking, a light crop. Old trees a failure, particularly Moor Park trees that bore heavily last year, very poor this year. Young trees fair.

Peaches.—Elberta and Nichols: Fair. Pullar's Cling: Fair to good, but patchy (some a complete blank). Briggs (young): Fair. Hales: Fair. Comets: Poor, young trees poorest. Lady Palmerston: Poor, young trees poorest. Sneed: Light, young trees poorest.

Nectarines.—Failure.

Prunes and Plums.—Very light.

Pears.—Mostly Williams: Very fair, promised to be heavy, but great numbers have now dropped.

Taken as a whole the crop will be light. The blossoms were much smaller in the petals than at other seasons. Those trees that were irrigated earliest give most promise in all varieties.

Apples.—Are just forming.

Citrus.—Trees promise heavy crops.

Grapes.—Are not in bloom, but look well.

Prospects of fruit crops, season 1914-15, in the Maryborough district. W. P. Chalmers, Orchard Supervisor—

MARYBOROUGH, DUNOLLY, BET BET.

Cherries: Very light. Apples: Light. Pears: Medium. Early Peaches: Light. Late Peaches: Fair. Plums and Apricots: Failure.

AMPHITHEATRE.

Apples: Very light. Pears: Medium.

GUILDFORD.

Cherries: Light. Apricots: Failure. Plums. Light. Apples: Fair. Pears: medium.

POMONAL.

Apples. Failure.

HORSHAM.

Quantong.

Apples: Fair. Pears: Good. Peaches: Good. Apricots: Good to medium. Plums: Fair. Almonds: Fair.

Riverside, Young's Colony.

Every variety of fruit a failure.

Summary.

Apricots: Failure. Peaches: Very light. Apples: Very light. Pears: medium. Plums: Very light. Cherries: Very light. Almonds: Very light. Quinces: Failure.

The lightness of crop seems to be due to drought conditions and late frosts. Where trees were irrigated in December and March fair crops of fruit have set.

Prospects of fruit crops, season 1914-15, in the Mildura district. *G. H. B. Davidson, Orchard Supervisor*—

Apricots are light in Mildura, but at Merbein on the young trees have set very heavy crops. Peaches have set very well, both at Mildura and Merbein. On some three-year-old Elberta trees they are carrying over two cases to the tree. The early varieties have not set very heavily. Plums are light, although some blocks are carrying good crops. Pears have set very heavily, both at Mildura and Merbein. It is too early to say how the Citrus crops are, although some Navel Oranges have set very well. There was a very heavy show of bloom on the Citrus trees this year.

Jonathan Apples have set well. Too early to say as to the other varieties. Almonds are carrying heavy crops in Mildura.

Prospects of fruit crops, season 1914-15, in the Mornington district. E. Meeking, Orchard Supervisor—

Apples.—*Jonathan: Medium to light. Gravenstein: Light. Williams'* Favorite: Light. Munro: Light. Statesman: Light. Emperor Alexander: Medium. Æsopus Spitzenburg: Medium. Cox's Orange: Light. Reinette du Canada: Light. Pomme de Neige: Light. Yates: Very light. Rymer: Light. Stone Pippin: Light. Rome Beauty: Only now in bloom. London: Only now in bloom. Rokewood: Light.

Pears.—*Williams' Bon Chretien: Heavy. Buerré de Capiaumont: Heavy.* Buerré d' Arjon: Light. Beurré Clairgeau: Medium. Keiffer: Medium to light. Napoleon: Heavy to medium. Josephine: Very light. Winter Nelis: Light. Winter Cole: Medium. Howell: Heavy to medium.

Apricots.—Moor Park: Light. Beuge: Medium. Oullin's Early Peach: Light. Hemskirk: Light.

Plums.—*Black Diamond: Heavy. Pond's Seedling: Medium.* Reine Claude de Bavay: Light. Reine Victoria: Medium. Early Orleans: Medium. Coe's Golden Drop: Light. Washington: Medium. Jefferson: Light. Burbank (Japanese): Heavy. Satsuma (Japanese): Medium. Cherry Plums: Medium.

Cherries.—The few that are cultivated have only a light setting.

Peaches.—Very few grown, and these are light.

Quinces.—Only a few cultivated.

Prospects of fruit crops, season 1914-15, in the North-Eastern district. C. F. Cole, Orchard Supervisor—

Peaches, Apricots, Almonds, Plums, Cherries, Quinces, Figs: The crop practically ruined in all districts by late frosts.

EUROA, BENALLA, WANGARATTA, BEECHWORTH, BARNAWARTHA, WODONGA, BRIGHT, CHESHUNT, NORONG, KIEWA.

Apples and Pears: Light to medium crop. Spoilt if drought continues.

STANLEY.

Pears: Heavy. Apples promise a heavy crop.

Oranges and Lemons in the North-Eastern District promised well, but owing to the want of rain the blossom is falling. A light crop is expected where irrigation is not practised.

Loquats: Light to medium.

If good summer rains fall, heavy second crop of figs expected.

Prospects of fruit crops, season 1914-15, in the Northern district. S. A. Cock, Orchard Supervisor—

The first crop for the season 1914-15 will probably be the lightest on record throughout the Northern District.

Peaches, Apricots, and Plums are extremely light. The trees blossomed well, but the fruit failed to set. This was due in a large measure to the late frosts

Pears and Apples will be a very light crop. Thrip also is responsible in a large measure for this.

Figs and Almonds have set a heavy crop.

Grapes promise a heavy crop, also Oranges and Lemons. Tomatoes promise to set a heavy crop, and the vines are looking very healthy.

Red and Black Currants and Strawberries show a medium crop.

Gooseberries are a total failure, owing to late frosts.

The disastrous drought is being sadly felt in non-irrigated orchards, and unless heavy rain falls shortly great numbers of old and young trees will perish.

In the Rochester, Echuca, Nyah, Swan Hill, and Murrabit districts growers are fortunate as regards irrigation supply, and fruit trees, vines, and intense culture crops generally look well.

Prospects of fruit crops, season 1914-15, in the Western district. A. J. McCalman, Orchard Supervisor—

Owing to the extremely dry weather before and during the blooming period, the thrip pest destroyed a great deal of the blooms. In addition, severe frosts in places completed the destruction of the fruit.

At a number of orchards at Mount Cole, near Ararat, the frost was so severe that practically no fruit will be gathered.

Apples.—Jonathan: These will be light; they set fairly well in places, but bloom was light in many orchards. Rokewood: Badly damaged by thrip, almost a total failure, except about Warncourt, where there will be a light crop; Stewart's Seedling, Sturmer, Gladstone, Newtown Pippin, Cleopatra, Stone Pippin, Winter Majetin, Northern Spy, Munro's Favourite (Dunn's Favourite), and Hoover show light crops. Rymers are setting well in places, but many trees had no bloom: light crop. The same applies to Gravenstein and Reinette du Canada. Rome Beauty: These are not yet all in bloom; probably the crop will be light on account of the thrip.

Pears.—With the exception of the Williams', which have set heavily, pears will be almost a total failure. Light crops of Gansell's Bergamot are to be seen in a few orchards.

Apricots.—All varieties will be very light. On a few irrigated orchards fair crops are to be seen, young trees being the best.

Plums.—There are a few fair crops of Cherry Plums. All other kinds, including Japanese plums, are a failure.

Peaches.—There are not many grown in the district; crops will be fair.

Cherries.—Nearly all varieties show light crops.

Quinces.—These are a complete failure.

Gooseberries.—Also a complete failure.

SUMMARY.—Apples: Very light. Pears: Williams pears, heavy; others, almost a total failure. Apricots: Very light. Plums: Almost a total failure. Peaches: Fair. Cherries: Light. Quinces: a total failure. Gooseberries: A total failure.

Owing to lack of irrigation in most of the orchards what fruit does come to maturity will be very small unless good rain comes later. Many growers have failed to complete the ploughing of their orchards, owing to the hardness of the ground.

EXPERIMENTS conducted in Germany with seven different kinds of soils extending through two years to determine the influence of various factors of growth, especially water, on the maximum yield, went to show that the ratio of grain to total yield decreased as the water supply increased. The nitrogen content of the crop decreased, while the potash, and especially the phosphoric acid, increased with the increase of the water supply.—*Experiment Station Record*, U.S.A.

BEE-KEEPING.

Mr. Chas. Marks, Larpent, inquires as to why so many bees return to the old hive and others get underfoot when artificially swarming a colony as advocated in a weekly paper a little time ago.

Mr. Beuhne, the Departmental Bee Expert, replies as follows:—

The reason why so many bees returned to the old hive is that they naturally, by instinct, went back to the old spot. The old hive left in its original position, would also attract them by its familiarity of appearance and the odour of the combs. Bees should never be shaken or brushed off the combs on to the ground, but into the hive; there will be then less trouble with bees taking wing and flying back, and none with getting them underfoot. Also the operation is best carried out when bees have stopped flying for the day.

To counteract the attraction exercised on the bees by the old hive it is best to use " it," instead of a new one, for the swarm (to be formed), for the queen and frame of brood, and the new hive for the old combs. Thus with the two hives alongside each other, the new box with the old stock on the old spot, and the old box containing the queen and made swarm beside it, the bees will be more evenly divided. If, in returning from the fields too many bees enter one box, the desired balance can be obtained by moving that box a little further away sideways from the old spot.

It should not be overlooked, however, that as all the bees of a hive do not fly every day it may be several days before the bees have all permanently attached themselves to one or other of the two hives.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Monthly Report ending 14th November, 1914.

This month has been very trying for the birds, owing to the hot weather, which reduced their appetites and caused a large percentage to go broody, about 55 in all—as many as four out of six birds having gone broody in one pen—this naturally reduced the egg yield considerably, and it will take a week or ten days before they are in full lay again. Everything has been done for the comfort of the birds in the way of shelter and damping the dust baths. The water drip system has been put into operation, and it has been very beneficial during the hot weather, as there was a running stream of cool water all day long. The birds stood the hot weather well, and only one death occurred through heat apoplexy.

More green stuff was fed and less animal food was given during the hot weather.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

LIGHT BREEDS.

Wet Mash.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Oct.	15th Oct. to 14th Nov.	Total to date, 7 months.	Position in Competition.
25	White Leghorns	J. H. Gill	858	157	1,015	1
30	"	E. A. Lawson	841	171	1,012	2
9	"	J. J. West	785	139	924	3
26	"	Mrs. H. Stevenson	741	168	909	4
16	"	A. R. Simon	758	149	907	5
10	"	R. Hay	763	139	902	6
17	"	F. Doldissen	723	145	868	7
40	"	J. Schwabb	732	130	862	8
33	"	W. G. Osburne	713	145	858	9
37	"	S. Brown	720	137	857	10
19	"	Marville Poultry Farm	694	154	848	11
29	"	V. Little	703	142	845	} 12
45	"	H. C. Brock	696	149	845	
35	"	W. Tatterson	701	140	841	14
44	"	A. Ross	708	132	840	15
4	"	Giddy and Son	683	152	835	16
11	"	C. J. Jackson	666	160	826	17
23	"	S. Buscumb	658	145	803	18
15	"	E. Waldon	649	153	802	19
12	"	A. H. Mould	659	131	790	20
3	"	T. A. Pettigrove	669	111	780	21
1	"	F. G. O'Bree	630	145	775	
28	"	Utility Poultry Farm	627	148	775	} 22
47	"	W. G. Swift	636	139	775	
8	"	F. W. Brine	613	154	767	25
30	"	G. W. Robbins	611	149	760	26
34	"	W. A. Rennie	626	125	751	27
22	"	B. Mitchell	598	150	748	} 28
2	"	J. C. Armstrong	610	138	748	
24	"	C. Pyke	597	150	747	30
13	"	H. Hanbury	606	119	725	} 31
14	"	F. C. Western	573	152	725	
6	"	C. R. Jones	574	145	719	33
48	"	Bennett and Chapman	598	119	717	34
38	"	G. Hayman	559	156	715	35
20	"	A. W. Hall	559	151	710	36
42	"	E. W. Hippe	566	134	700	37
18	"	All-lay Poultry Yards	535	152	687	38
32	"	Gleadell Bros.	550	136	686	39
31	"	E. H. Bridge	519	140	659	40
41	"	Doncaster Poultry Farm	500	152	652	41
5	"	A. Mowatt	502	145	647	42
21	"	R. A. Lewis	515	121	636	43
43	"	G. Mayberry	464	143	607	44
49	"	A. Beer	500	103	603	45
39	"	R. L. Appleford	441	149	590	46
50	"	F. G. Silbereisen	403	144	547	47
27	"	Walter M. Bayles	412	125	537	48
46	"	C. L. Sharman	400	116	516	49
7	"	B. Cohen	355	133	488	50
		Total	30,799	7,082	37,881	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Oct.	15th Oct. to 14th Nov.	Total to date, 7 *months.*	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	834	171	1,005	1
55	,, ..	E. A. Lawson	816	156	972	2
65	,, ..	W. G. Osburne	758	140	898	3
53	,, ..	C. Lawson ..	734	128	862	4
58	,, ..	Miss L. Stewart .. .	694	128	822	5
51	,, ..	Moritz Bros.	665	154	819	6
61	,, ..	H. Hanbury .. .	662	138	800	7
63	,, ..	Hanslow Bros. .. .	598	142	740	8
68	,, ..	E. W. Hippe .. .	560	141	701	9
52	,, ..	Myola Poultry Farm ..	542	149	691	10
70	,, ..	W. H. Robbins ..	548	137	685	11
64	,, ..	G. Carter ..	529	154	683	12
62	,, ..	A. Greenhalgh ..	537	145	682	13
64	,, ..	E. A. Carne	546	128	674	14
59	,, ..	F. G. Silberelsen ..	506	159	665	15
69	,, ..	C. J. Beatty .. .	527	132	659	16
57	,, ..	J. Jackson .. .	530	112	642	17
67	,, ..	Walter M. Bayles ..	485	144	629	18
66	,, ..	S. Brown	335	110	445	19
		Total	11,406	2,668	14,074	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	J. McAllan	789	149	938	1
71	,, ..	J. Ogden .. .	759	113	872	2
80	,, ..	Marville Poultry Farm ..	743	124	867	3
83	,, ..	B. H. Pump .. .	731	121	852	4
81	,, ..	D. Fisher	711	96	807	5
82	,, ..	J. H. Wright	711	90	801	} 6
84	Rhode Island Reds	J. Mulgrove	706	95	801	}
76	Black Orpingtons ..	W. P. Eckermann ..	638	111	749	8
74	,, ..	S. Brown	619	104	723	9
76	,, ..	*Fairdeal Poultry Farm* ..	604	116	720	10
87	,, .	A. Douglas	564	141	705	11
72	,, ..	T. W. Coto	602	87	689	12
73	,, ..	J. A. McKinnon ..	558	123	681	13
63	,, ..	Cowan Bros.	555	78	633	14
85	Golden Wyandottes	J. C. Mickelburgh ..	460	95	555	15
78	Red Sussex ..	Jorgen Anderson ..	466	58	524	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	353	93	446	17
86	Buff Wyandottes ..	W. G. Swift	312	54	366	18
		Total	10,881	1,848	12,729	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	687	104	791	1
90	,, ..	J. H. Wright	602	123	725	2
98	,, ..	A. Greenhalgh	592	119	711	3
97	,, ..	Jas. McAllan	586	113	699	4
94	,, ..	T. W. Coto	597	92	689	5
91	,, ..	C. E. Graham	520	118	638	6
96	Rhode Island Reds	*Myola Poultry Farm* ..	507	94	601	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	471	113	584	8
93	,, ..	Myola Poultry Farm ..	439	113	552	9
90	White Plyth. Rocks	Mrs. G. R. Bald ..	349	107	456	10
95	,, ..	C. L. Hewitt	203	80	283	11
		Total	5,553	1,176	6,729	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is a danger from the prevalence of the moth.

By the use of arsenate of lead the moth pest is very easily kept in check, and from being one of the most formidable of orchard troubles, it has come to be one of the least feared of all pests. By constantly spraying with arsenate of lead, the use of bandages as a trap for codlin larvae is now quite unnecessary. In fact, bandages, more often than not, become a harbour and a breeding ground. Further, the time spent in overlooking and attending to the bandages may be employed far more profitably by giving the trees an extra spraying.

One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherry trees for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

Cultivation.—All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have as much moisture as possible during the growing season; seeing that the present season is so excessively dry every effort should be made, by constant cultivation, to retain for the benefit of the trees, whatever moisture is in the soil. The transpiration from fruit and foliage is considerable at any time, but during hot and dry weather the amount of moisture which is required by a tree, and which is ultimately transpired from the tree, is very exceptional.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture and are not able to retain or obtain sufficient for their nourishment; they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to keep up a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

Pruning.—Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree, and to increase the development of new fruit buds.

Vegetable Garden.

Tomatoes will require a good amount of attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be an advantage to tie the plants to stakes. Training them to two or three main growths, and pinching out the laterals as they come

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

All plants of the cucumber family should now be constantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side shoots of the celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all the weeds.

Flower Garden.

As frequently emphasized in the "Garden Notes," surface cultivation is very necessary at this time of the year. To secure a constant earth mulch, as friable as possible, should be the aim of every gardener during the hot months of the year. After every watering or rainfall the surface should receive a good stirring.

The season has been a very unfavourable one for roses owing to the hot dry weather, and also to the severe attack of thrips. For this pest nothing has so far been discovered that is an efficient remedy. The only deterrent is a good shower of rain, accompanied by a cold snap. For the next two months the roses should have a rest from blooming, so that the autumn crop of flowers may be produced as fine as possible. Water may be almost wholly excluded during this period, provided that the beds or plants be earth mulched, or mulched with some light non-stimulating material, such as grass or straw.

Late spring flowering bulbs should be lifted, and stored in a cool, dry place. It is advisable to allow the bulbs to become dry before storing them away, by leaving them on the surface and shaded for a day.

All annuals, biennials, and herbaceous plants which are approaching the period of bloom should now be supplied with frequent supplies of water; and a mulching of well rotted manure will help them greatly.

Dahlias may now be planted out, making two or three plantings, extended to the end of the month. The young plants should be planted firmly in the soil; and, in order to prevent overcrowding when the plants are full grown, the plants should be spaced at least 3 feet apart each way.

Chrysanthemums will now require considerable attention; the weak and unnecessary shoots should be removed, and the remaining growths well staked. All side shoots should be removed as the plants mature. The soil must be kept cool and moist, but excessive or even abundant water must be avoided until the plant is well grown.

The sowing of seed for late flowers may be made, especially of such plants as zinnias, asters, and winter flowering stocks.

MANURIAL REQUIREMENTS.

Experiments devised with a view to ascertaining the essential minimum amount of available phosphoric acid and potash required to produce maximum growth were made at the New York Agricultural Station.

The crops used included barley, peas, tomatoes, tobacco, buckwheat, rape, and turnips.

The conditions of temperature and moisture were under control and were, as far as possible, regulated so as to fully satisfy the requirements of the plants throughout the experiments.

The results obtained show, writes W. N. Jordan, considerable uniformity amongst the different crops, no fixed relation exists between the production of dry matter and the amounts of phosphorus and potash utilized. Up to a somewhat indefinite point the production of plant substance increased, in most cases, with increase in the supply of the variable constituent, but beyond that point increase in the consumption of both phosphorus and potassium compounds only resulted in an increase in the proportion of phosphorus and potassium in the plant tissues, and not to a corresponding increase in plant growth. The results also confirm the conclusion that the chemical analysis of a given crop is no certain criterion of the manurial requirements of that particular crop.—*Fertilizers*, 27th June, 1914.

The object of this note is to point out to the farmer that artificial fertilizers should be used judiciously. A fair amount of potash as a fertilizer is used in Australia, principally by orchardists Practically the whole of this is imported from Stassfurt, in Germany.

Should the present state of affairs existing in Europe continue for any length of time it is quite possible that the orchardist will have to do without potash fertilizers.

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

Pigs.—*Sows.*—Supply those farrowing with short litter in well ventilated sties. Pigs should be provided with plenty of clean water so that they can wallow in it. Read articles on breeding and feeding in *Journal of Agriculture* for April, 1912, and June, 1913.

Sheep.—If forced to disturb sheep at all, move them quietly and carefully, and not in the heat of the day. Old burrs, dead grass, stained and old straw, &c., are fatal to even young sheep unless they have access at will to abundance of good water, plenty of coarse salt, and, as well, purgative drenches or pills to those showing signs of sickening. Ewes this season, not having had the customary spring renewal, will come in season later and more irregularly than usual. Keep rams in good heart, as advised last month, and remember they work best among ewes at night. Unhealthy sheep attract flies, therefore drench at any appearance of unhealthy discharge, especially among weaners.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabbi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of odium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

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